COMPUTING AGE

OCTOBER 1985 £1.00

FIRST ISSUE!

THE LEAP TO 16 BITS

- LOG ON TO GOLD
- COMPACT DISK STORAGE
- BBC EPROM BLOWER

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Bushfield House, Orton Centre, Peterborough PE2 0UW. Telephone (0733) 237111. Telex 32157. A member of the East Midland Allied Press Group

Dear Subscriber

ELECTRONICS & COMPUTING MONTHLY

As a regular reader of **Electronics & Computing Monthly**, you will, by now probably know that last month's issue of **E&CM** was the last to be published. While the title has gone though, the style and content of **E&CM** will continue in a brand new magazine, **Computing Age**. As an established E&CM subscriber, your subscription has been automatically transferred to **Computing Age**.

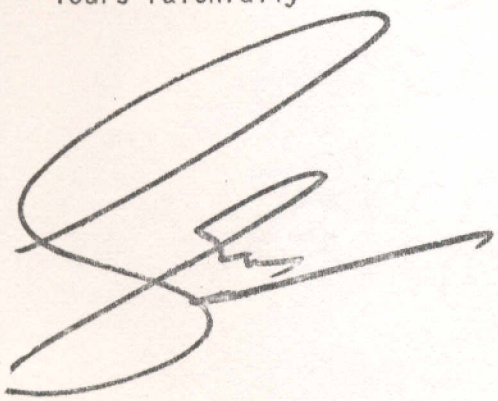
After looking through the first issue of the magazine, we hope you will agree that we have retained all the features that made **E&CM** the leading computer projects magazine, while broadening our coverage of the micro computer market in recognition of the way in which it has changed over the years.

Computing Age will be paying close attention to the two major growth areas in computing - the new breed of low cost, high power 16 bit machines and the application of micro computers in communications, including services such as Prestel and Telecom Gold. We shall also continue to publish the projects and technical features that were such an important part of **E&CM**.

We hope you will like the new magazine, and would appreciate it if you would write and let us know of any comments you may have on the style and content of **Computing Age**.

With best wishes.

Yours faithfully



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COMPUTING AGE

Volume 1 Issue 1 October 1985
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EMAP National Publications

Published by
EMAP Business and Computer Publications

Printed by
The Riverside Press, England

Subscriptions enquiries
Telephone 0858 34567

Computing Age is normally published on the 13th day of each month.

Unfortunately we are unable to answer any telephone enquiries, any written enquiry requiring a personal answer must be accompanied by a stamped self addressed envelope – please allow up to 28 days for a reply.

Subscription rates: UK £15.00 including post.

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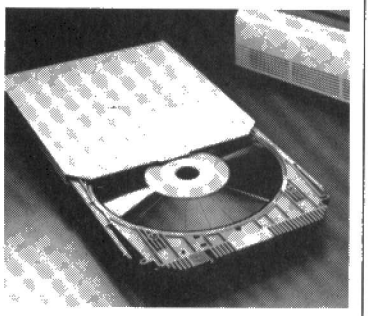

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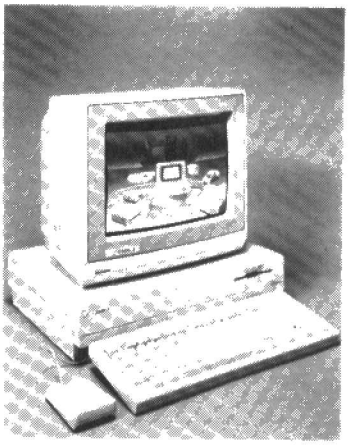

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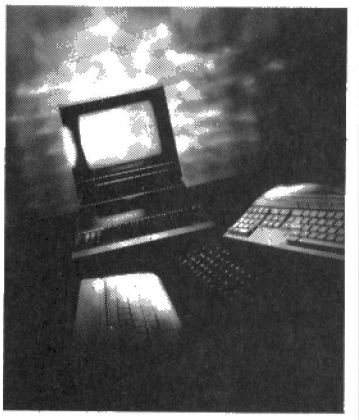

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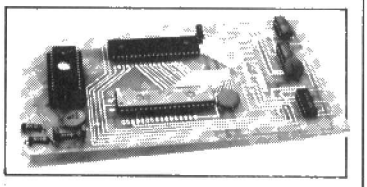


42 Blowing your own EPROMs made easy.

Computing Age is born

Welcome to the first issue of *Computing Age*, a brand new magazine for the micro owner who wants to make the most of their computer be it in the home, education or business. *Computing Age* is the result of the metamorphosis of the magazine Electronics and Computing Monthly. Readers of E&CM will recognise that many of the popular features that appeared in this magazine have been retained in *Computing Age*. They will also see a range of new material that aims to build on the coverage offered by E&CM.

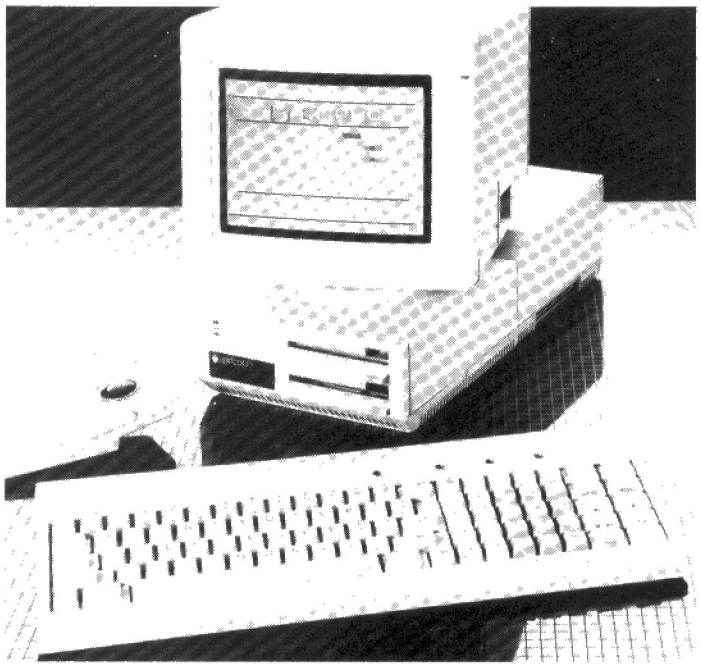
New readers will, we hope, quickly discern that *Computing Age* is all about doing things with your computer. The most expensive computer in the world is just a collection of copper, silicon and plastic until it is switched on and running software. We will aim to give you a reason to switch on your computer and tell you where to get, even to write, the software in order to make it operate to your requirements.

Applications covered in *Computing Age* will range from micro based communications systems, including electronic mail and database services, to putting a computer in charge of your home.

Another important aim of the new magazine will be to keep readers in touch with the very latest in computing technology. We'll be going beyond the restrictions of the usual new product reviews though, with thoughts on the applications of new hardware. We'll also be looking beyond the frontiers of current technology with reports on the techniques and equipment that will affect the way in which computers are used in the coming years.

We'll not be dodging the social implications of all this new technology either – look out for some thought-provoking articles in the near future.

Finally, as this is the first issue of *Computing Age*, it is important to know what you, the reader, think of the magazine. Any comments you have will be gratefully received at the editorial address shown on the contents page.



ACT – now known officially as Apricot – has announced a new range of micros including an upgraded F1, called the F2. There are three major areas of improvement over the F1. The new machine has two 720K disk drives instead of one; the keyboard is a full travel mechanical version, no membranes here; and the awful 'Activity' graphics environment is replaced by GEM. The F2 costs £500 more than the F1 – unfortunately – but included in the price is GEM Write, GEM Paint, MS DOS 2.11, GW Basic, communications software and IBM emulator. 512K RAM and a cordless mouse are standard. A 10Mbyte hard disk version, the F10, is also available, and a portable (or more accurately, luggable) the FP.

NEXT MONTH

Competition

Free to enter competition presented in conjunction with Micronet 800. A host of valuable prizes up for grabs.

Hard disk drives

A look behind the technology of hard disk drives – units that offer mega bytes of storage at a cost that's coming within reach of many users pockets.

Music the MIDI way

MIDI, Musical Interface Digital Instrument, is a standard interface for the connection of micro computers and musical instruments such as synthesisers. We've details on the technical background to the MIDI spec. and take a look at some products that make use of this interface.

Optical processing

A new breed of processor system that substitutes photons for electrons.

PLUS

PCW show highlights including details of the plethora of Atari 520ST Software launched at the show.

ON SALE OCTOBER 13

More details of the content of November's Computing Age can be found on page 49.

Acorn takes on IBM with one-per-bench

Often rescued Acorn Computers, Cambridge-based maker of the BBC Micro, is hoping to bring its troubles to an end by breaking into a new market. Its new machine, the Cambridge Workstation, described as equivalent in power to DEC's VAX minicomputer, is a specialist machine targetted at engineers and scientists.

The one-per-bench, as the machine could very well be called, is available both as a standalone machine, and as an upgrade to the BBC Micro. Based upon National Semiconductor's 32-bit 32016 microprocessor, the Workstation is said to be able to run mainframe applications and languages such as Fortran 77, LISP, Pascal and 'C' in unabridged forms.

It's quite a departure from the BBC Micro. While justifiably hailed in its heyday as a successful attempt to bring serious computing to the masses, the BBC Micro now appears as an absurdly overpriced and underpowered anomaly in a hopelessly saturated market. The public which it helped to educate have made the best of their new computer literacy and walked away from it in droves.

Acorn's history now bears a strong resemblance to that of ICL, another British Company that went its own way, away from the IBM-compatible mainstream. Like ICL, Acorn has required massive injections of cash to keep it from complete collapse; and like ICL, Acorn has passed into the hands of a foreign-multinational. The current round of refinancing has been supplied largely by Olivetti, but also by the BBC and six major suppliers. The company is currently unwilling to release details of its financial position.

The Cambridge Workstation enters a market for scientific microcomputers already dominated by Hewlett Packard and IBM. Acorn's own figures put the potential market at 100,000 UK scientists and 530,000 engineers, plus an existing base of 100,000 BBC Micro users (who may or may not be willing to part with £1399 to put the power of a VAX on their dining room tables).

With its bundled languages, hefty chunks of RAM (up to 4Mb), powerful processor and range of main-

QL price plummets – will it save Sir Clive?

Sir Clive Sinclair has bounced back from the Maxwell fiasco by announcing savage price cuts to his complete range of computers.

The QL, which has not sold in significant quantities since last Christmas, has been halved in price to £200. If it were not for an exceptionally good deal offered by Dixons, the 16-bit machine with built-in microdrives would be in competition with its stable mate, the Spectrum Plus.

Dixons retail shops will be selling a package which consists of the Spectrum Plus, 'datarecorder', joystick and Interface 2, and ten software titles for £140.

The discounted computers should guarantee Sinclair's position as leading home computer manufacturer in the UK, but will only patch up the company's cash crisis in the short term.

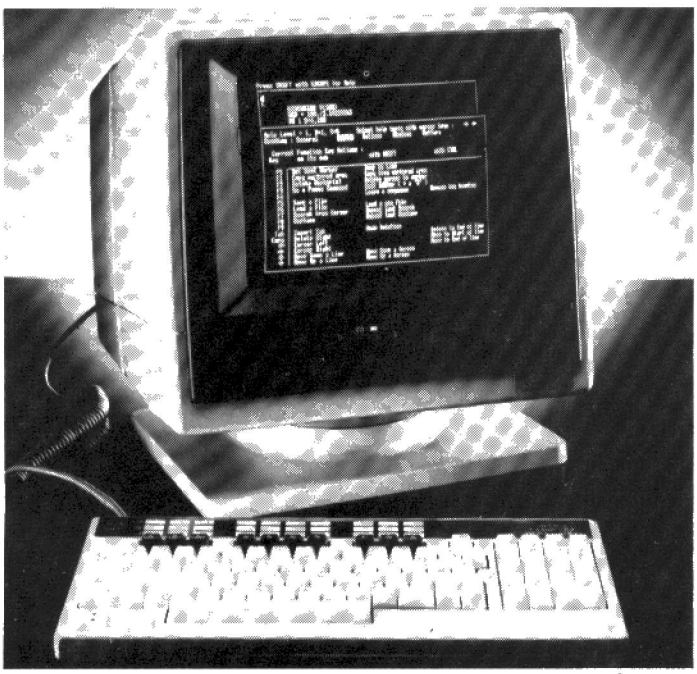
The well publicised £10 million Dixon deal relieves Sinclair of 160,000 unsold computers, which works out at around £60 per machine. This represents about half of the £30 million computer mountain of unsold stock in Sinclair warehouses, and in effect reduces the real value of the stock by one third.

So can the nation's favourite boffin survive now that Captain Bob has thought better of his 'patriotic' impulse? Much of Sinclair's problems were cuased by the precocious launch of the QL – a daring but seriously flawed innovation into which Sir Clive leapt before he looked. The new price will not make up for the QL's technical deficiencies and it won't be able to compete with the Atari ST range – but it can now take on the Amstrad machines. Proof that the machine is not a success came obliquely in a Sinclair Research press release announcing that an independent survey gave the Spectrum Plus 37% of the UK home computer market, and Sinclair overall just under 40%. Using simple maths we can deduce that the QL has less than 3% of the market.

In the long term Sinclair needs new products and finance for research and development. It is doubtful that a 128K Spectrum, rumoured to be in the offing, can recapture the initiative. That is far more likely to rest on the success of Sinclair's revolutionary waferchip research, but grandiose schemes of building a £50 million manufacturing plant for the chips now seem remote. Sinclair scientists claim to have cracked the problem of producing the giant silicon wafers, but of course we have yet to see them in action.

Leapt before he looked.

Is Maxwell's departure – as sudden as his arrival – any indication of the state of Sinclair fortunes? The answer must be no. Maxwell's bankers got cold feet after a careful look at the accounts, but The Man Who Pulled The Plug On The Mirror is himself in desperate need of cash to pay for new printing presses – Sinclair Research was a high risk (if high profile) venture costing valuable millions.



frame-scale application packages for engineers, the Cambridge workstation is a serious and very competitively priced contribution to the technical micro market. Whether Acorn can live down its over-publicised troubles, and succeed with the radical change of image the new product requires is another matter. The scientific community is better aware than most of the importance of support from a stable supplier.

• Acorn has announced a $20.58 million loss for the year to 30 June. The loss underlines the company's difficulties, and a second refinancing deal is currently being negotiated with creditors, the BBC, and the major stockholder, Olivetti. The new arrangement increases Olivetti's share in the company to 79.8%. Dealing in Acorn shares has resumed at an all time low of 2.5p.

Amstrad comes clean on 128K computer

In August, Amstrad did what everyone except Amstrad said it would do, and launched the CPC6128 in the UK.

The 128K machine makes up for the deficiencies of the CPC664 computer by having enough memory to run most CP/M applications. It first saw light of day in the USA in early Spring, but readers with long memories will recall that, at that time, Amstrad denied it had plans to launch the same machine in the UK. Nobody believed it, and after a suitable period of grace in which dealers have been able to offload stocks of the now obselete 664, the 6128 is here and in the shops.

The 'new' Amstrad differs from the CPC664 in only three respects: it has 64K more memory; a new video chip designed by Digital Research, the GFX, and an improved version of CP/M 2.2 called CP/M Plus. Everything else remains the same: the Z80 processor, single non standard 3" Hitachi disk drive, and the same

Flavour of the month

A quick straw poll of software houses' preferences has produced interesting results. The **QL,** which has found favour only with the most adventurous, is no longer the machine of the moment. Sir Clive's **premaddona** gave some clever companies a good grounding in 68000 programming, but she's been left waiting at the alter – former suitors have stated firmly they are looking covetously at the **Atari 520ST** and **Commodore Amiga.** These include **Metacomco** which has almost as much ST software on the go as it has Amiga products.

Atari has released an extensive list of companies ready to support the ST, including Digital Research (of course), Intelligent Software, Computer Concepts, GST, Talent, and Metacomco – the last three prominent in the QL market.

But not all are entirely enthusiastic. The ST, in particular, has been criticised for its tendency to **crash.** Digital Research said it had been told by Atari that the fault had been traced to two metal plates which were **prone to shorting.** The fault is simply rectified by removing the plates (yes, Atari **has** modified its production machines . . .).

Nor is Digital Research entirely **blameless.** It is said to have a bug list for the 68K C compiler long enough to frustrate most programmers. It seems the structures, although recognised as an important part of the language, are not worth the **effort.**

When questioned on the QL, most houses admitted to being saddened by the plight of Sinclair Research, but not one company was surprised.

Oddly – or is it odd? – at least a third of the companies we spoke to were more excited about the new 'old-tech' machines, most notably the **Amstrad** range. The technofreaks who demand a machine is taken seriously just because it has a **go-faster** stripe may yet realise that indulgence doesn't necessarily nurture success.

Amstrad? now isn't that the machine that use those peculiar **3" disks?** Does anybody else? Possibly, but not that I can recall. So can you beat this, from an Amstrad press release, for sheer **effrontery?** 'Over 8000 [CP/M] packages are made easily accessible on Amstrad's de facto standard 3" disk drives'. Tell that to **IBM** Mr. Sugar.

price – £299 with green screen monitor; £399 with colour.

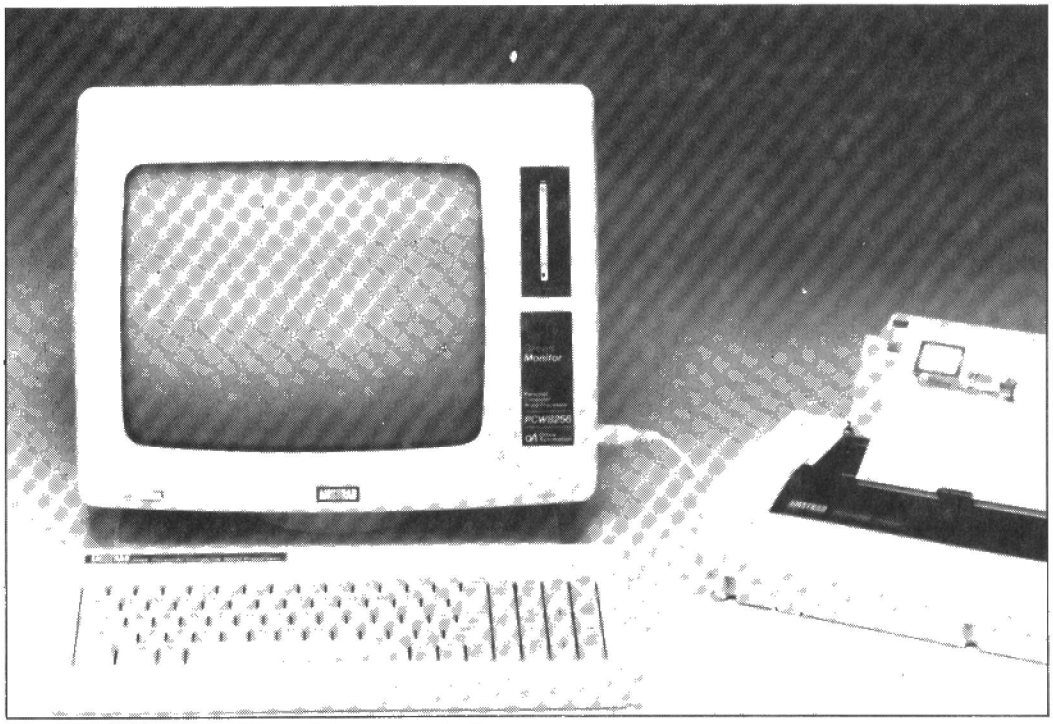
Simultaneously Amstrad announced its first true business computer, the PCW8256.

It's difficult to avoid a sense of deja vu when leafing through the promotional material for Amstrad's new top of the range computer. A comparison between this £458.85 bundled system and the ill-fated Sinclair QL cannot be resisted.

The PCW8256 is 'the first wordprocessor to be designed for absolutely anyone'. In Amstrad-speak this is everyone 'from the highly trained professional secretary . . . down to the chairman of a public company. But is there a market for a non-standard low-cost business system using outmoded technology?

The specification looks very like that of the CPC6128: The old Z80 processor running CP/M plus; 256K RAM (with 112K organised as a RAM disk); a single 3" disk drive with a formatted capacity of only 180K.

Bundled software includes the LocoScript wordprocessor, GSX graphics, Locomotive Basic and DR Logo. There is a 90 column x 32 line display, which can also be organised as 80 x 24, and two interface sockets, one a general purpose expansion port, the other a dedicated printer port.



The PCW 8256 comes with a printer as standard.

Missing from the list is an RS232 communications interface. A machine in this price range could succeed if it had good communications facilities – an essential business requirement today – but interface, modem and terminal emulation software will cost at least another £170, putting the total price up to £730 which is very near that of the superior 16-bit Atari 520ST.

• The new launches coincided with the announcement of price reductions to the CPC464 computer. A system with green screen monitor will now cost £199; the colour version is £299.

Exploiting Transputer for IT applications

The Transputer, the revolutionary processor developed by Inmos, should be in volume production by the first half of next year.

The transputer is a small chip which acts like a complete computer but carries out calculations more rapidly. On its own it can perform a wide range of computing tasks. It can also be used as a building block with other Transputers to construct high performance compact systems of the kind required for future information technology applications.

The transputer is designed to provide all the resources of a computer – including processing, memory and concurrent communications – on a single chip. The processor has access to two to four Kbytes of static RAM on the chip itself. The memory can be extended off-chip through a special interface enabling direct connections to both static and dynamic RAMs and providing data rates of up to 26 Mbytes per second.

Four high speed serial communication links enable interconnection with other transputer products for message transfers. The great strength of the transputer is that it allows parallel connection without the need to spend valuable processor time organising communication between the component parts of a system.

Cambridge Consultants is one of a number of companies reviewing applications which will be able to exploit the unique qualities of the transputer. An obvious first step will be areas of computer/communications convergence, But, 'past experience tells us that the most significant applications are likely to be the ones we haven't thought of yet,' said a spokesman for Cambridge Consultant's parent company, hedging his bets.

Sanyo has cut the list price of its MBC555-2 micro by £200. The dual 360K disk drive model is now priced at £1190. Discounting by dealers is likely to put the High Street price down well below that figure – possibly to as low as £900.

The announcement coincided with the release of an official Sanyo plug-in video board which will give the MBC550/555-2 series a high degree of IBM compatibility. The board costs £145 and runs hardware specific PC software including Lotus 1-2-3 and Flight Simulator.

Blueprint to beat the CAL software slump

In the present uncertain climate of the home computing industry, one of the sickest of the suffering has undoubtedly been educational software.

The demise of companies like Shiva and Ebury Software and drastic remaindering of educational software programs by Boots and Smiths has done nothing to encourage the belief that Computer Assisted Learning is the way of the future. Now, however, comes news of a positive initiative by eight of the survivors, which the companies hope will resuscitate not only the interest of parents and teachers, but confidence in the micro as a teaching tool as well.

BESA (British Educational Software Associates) consists of ASK, Calpac, Bourne Educational, Griffin, Collins, Widgit, MacMillan and Hill MacGibbon, who between them have enough experience to believe that the problems their industry has encountered were largely due to a 'grossly distorted view of the market place', a lack of good programs and a restricted range. Now they are offering, "top quality imaginative software which really does something," and have set up their own distribution network.

Initially, 200 retailers, covering Scotland and Wales as well as all parts of England, will offer a core of 40 titles, with rapid access to a further 200 or so programs designed to run on Spectrum, BBC, Electron, Amstrad and Commodore machines. BESA dealers will also demonstrate programs on request.

The distributors, Proteus Computing Ltd, report an encouraging and positive response from many retailers including some who had previously been written off as totally uninterested in the educational angle. Proteus sees the present reaction as dealers recognising the opportunity to establish themselves as specialists in a market which is effectively starting afresh.

Other producers are watching the initiative carefully. A number of companies are talking about joining BESA if they can show improved sales through their outlets. If BESA is right about the 'strong but frustrated demand for educational software', there are plans for an advisory service, specialist software writing service and even possibly a lending library service for impoverished teachers.

Contact Barbara Warren at Calpac, 048 67 2584, or Martin Neild, MacMillan, 01 836 6633.

Optical storage devices are leaning to write

Optical storage devices will have a read/write capability by late 1987 if research currently being undertaken by Verbatim and the Philips electronics group bears fruit.

A number of manufacturers intend to market compact disk drives for computer storage within months, but these systems, based on audio CD technology, cannot be written to by the user (see article page 14).

The proposed specification of the Verbatim drive shows what can be achieved by optical technology. The drive will be designed to occupy the same slot as a full size 3.5" disk drive and will offer capacities of up to 150 megabytes with a possibility of 600 megabytes as the technology is refined. The price for this sort of storage capacity could be as little as £300 in OEM quantities; at these price levels it is likely that optical rather than Winchester (hard disk) storage drives will in future be used for data stores of up to 100 megabytes.

The technology that allows a CD disk to be used as both a read and write store is in fact a mix of magnetic and optical science. The disk surface is coated with a thin layer of material formed of a mixture of iron and rare earths. The surface is pregrooved with a fine 1.6 micron groove to allow the laser to track its surface.

The coated disk is rotated in a DC magnetic field and a modulated laser beam makes a spiral of minute hot spots as the surface temperature rises above its Curie point. The Curie temperature of the material will depend on both the power of the laser beam and the strength of the magnetic field. A careful balance has to be kept between these two factors if the information is to be reliably recorded.

The retrieval of information depends on an effect known as the Kerr effect. This is based on the observation that light reflected from the magnetic material will be subject to a change in polarisation. The change is very small; to detect it the CD player passes the reflected beam through a series of crossed polarised filters rather like the lenses of Polariod sunglasses. These have the effect of accentuating the light beam's shift in polarisation. After passing through the filters the beam is split in two and then passed to a pair of detectors arranged in a circuit configuration that further increases the changes in polarisation.

It is possible to re-use the disks by erasing the information stored on the surface. To erase a disk it is simply exposed to an unmodulated laser beam operating in a constant magnetic field.

Experimental systems based on this technology have already managed to record a 1MHz signal and have achieved a signal to noise ratio of around 50dB – quite good enough for the recording of digital data.

An alternative method of implementing a read/write CD system is based on the observation that some materials can exist in two forms, amorphous and crystaline. In a crystaline form molecules arrange themselves in an ordered fashion while in the amorphous state they are disordered. The reflective characteristics of the two states are different and can be detected by a playback laser. To change the state of a material such as tellurium from crystaline to amorphous it is necessary to briefly heat it then allow it to quickly cool down.

With at least two companies demonstrating prototype CD read/write systems there can be no doubt that commercial units will appear in the near future. The possibilities opened up by such technology will revolutionise many aspects of computing and software publishing.

Atari shipping STs but GEM still unfinished

Atari is now shipping its ST computers to software houses, user groups and educational establishments. The company has also announced that 'over 100 software packages' will be introduced at the PCW show in September.

However we believe that the ST will not be available in the shops until late September. Sources at Digital Research, the company who wrote the Atari operating system and bundled software, indicate that two applications packages, GEM Paint and GEM Write, are not yet properly implemented on the ST.

At the launch of GEM on 15 August only GEM Draw was seen working on the Atari ST. A Digital spokesman said that it would be around six weeks before the other packages were ready, and that this was a matter 'outside our control'.

The ST may not be ready yet, but there is good evidence that it will receive excellent support from third party software suppliers – an impressive collection of famous names has signed up.

Atari president Jack Tramiel is gunning hard for the education market, and a scheme has already been operating for one month whereby schools and colleges receive an ST with applications and development software for £470. 'We believe that this machine is a natural successor to the BBC Model B', is the Atari opinion.

Alan Sugar: an impressive track record.

The spectacular rise and rise of Amstrad

Amstrad has achieved spectacular success in a most unspectacular way. Gary Evans reports on the rise and rise of this least likely of contenders.

Amstrad came to the home computer market at rather a late stage: its first machine, the CPC464, was not launched until April of last year. By this time Sinclair, Acorn and Commodore had firmly established themselves in the low cost computer market and there seemed little scope for newcomers.

April 1984 also brought the first warning signs that the home computer market was reaching saturation point and that the sales volumes seen during 1983 were unlikely to be maintained. But Alan Sugar, chairman of Amstrad, had an impressive track record, and perhaps he knew something that the others didn't.

Amstrad's experience in the hi-fi industry led them to offer the buying public a computer that was the equivalent of the audio rack system. The, CPC464 was one of the first home computers to be sold as a bundled package. The machine was supplied complete with a monitor and a built-in cassette recorder. All purchasers had to do was fit a plug and they were ready to start computing. This was the type of product that would appeal to 'the lorry driver and his wife' – in Alan Sugar's view any consumer product needs to appeal to this sort of buyer if it is to achieve a reasonable volume of sales.

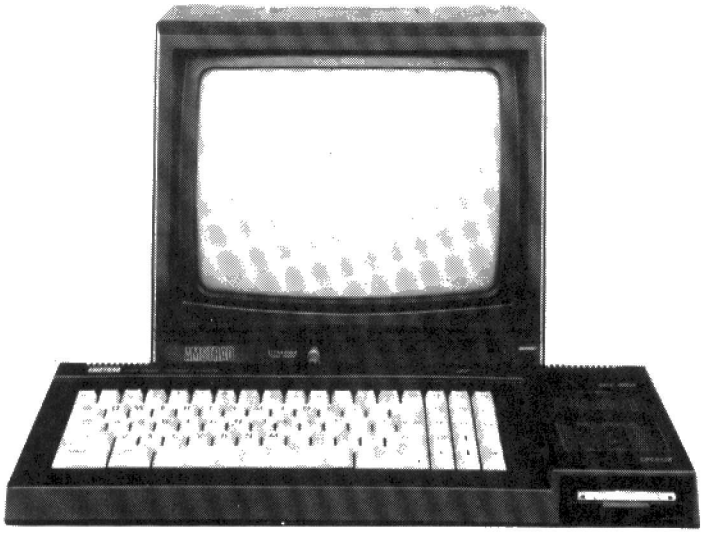
The passage of the CPC464 from the initial decision to go ahead with the product to the time when initial supplies reached the shops was not a smooth one. The people initially recruited to make the computer a reality had difficulty in designing a package that would meet Amstrad's design brief. It was at this stage that Roland Perry, shortly followed by William Poel, entered the scene. both had been involved with Ambit, a component distribution company, but found the challenge of the CPC project irresistible. They joined Alan Sugar's company to take over responsibility for Amstrad's fledgeling computer division.

At an early stage of the design process it was decided that the Amstrad computer would be based on tried and tested eight bit technology rather than the more adventurous, in terms of the consumer market at that stage, 16-bit devices. This meant that another important design objective could be met, namely that the complete system should sell for less than £200. In the event a combination of factors, including an adverse dollar/pound exchange rate and a semiconductor famine that pushed up the price of the memory and CPU, meant that Amstrad failed to bring the machine in under the magic £200 barrier by £39.

'The CPC6128 had more memory – it was the machine the '664 should have been'

At £239 for a system based around a green screen monitor and £349 for the colour set up, the CPC was a powerful computer offering excellent value for money. During last Christmas the CPC464 man-

Continued overleaf



All in one – the Amstrad CPC6128.

Amstrad's rise

continued

aged to win itself a fair portion of the market.

As software houses saw that the Amstrad computer was achieving significant sales volumes, a variety of games and utility packages started to come onto the market. A broad base of readily available software is essential if any computer is to succeed and the stream of titles published during 1984 gave the CPC464 a seal of approval.

Amstrad were not content to rest on the success of the CPC464 and continued to develop new hardware for the machine: a 3" disk drive plus interface was soon available, and Amsoft, the company's software division, supplemented the supply of the independent software houses.

'Amstrad's CPC464 was the computer equivalent of the audio rack system'

The next milestone in the history of Amstrad's computer division came in April 1985, one year after the launch of the '464, with the announcement of the CPC664 computer. This machine was, in effect, a '464 with the cassette data storage unit replaced by a built-in 3" disk drive. The CPC664 was hailed as a computer that would answer the needs of the small businessman who could not afford to spend in excess of £1500 pounds on the likes of an IBM PC.

A cornerstone of the computer's appeal in the business environment was, according to Amstrad, that it came equipped with the CP/M operating system and thus opened up a vast range of applications software. This sounded fine in theory but in practice the idea was fatally flawed. When running CP/M, the '664 simply did not have enough memory for much of the off-the-shelf software available. In hindsight it looks as if the CPC664 was very much a stop gap computer.

The CPC6128, launched at the start of last month, is the machine that the '664 should have been. As its designation suggests the '6128 features 128K of RAM. This provides a suitable environment for CP/M programs and overcomes the problems associated with the '664. The CPC6128 retails at £299 (green screen) and £399 (colour monitor).

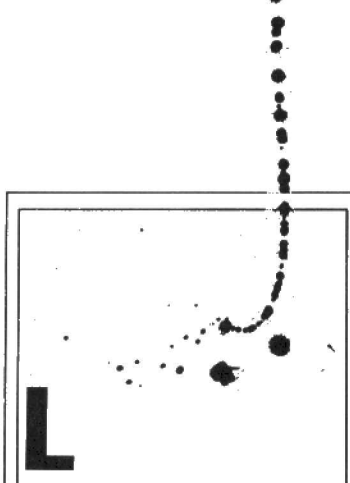
The launch of the 128K computer was quickly followed by the machine that Amstrad hopes will give it a foothold in the business market. Details of the £399 PCW8256 package can be found in the news section. This system brings to the businessman a complete, ready to run word processing system at a price that is less than many electronic typewriters.

Amstrad's current range offers products that appeal to all sectors of the computer market, from the games player's favourite the '464, to the low cost business system represented by the PCW system.

As to the future, the product life of the 464, according to Alan Sugar, will not extend beyond this year. In the chairman's view, no computer without a disk drive will stand any chance in the market of 1986. The company must be looking to extend their range at the upper end and these plans must surely include a design that will be based on a 16-bit processor. The PCW system manages to achieve a level of performance that is quite remarkable for an eight bit Z80, but you can only push eight bit technology so far.

- Please note that after the cover mounted booklet, the magnificant 7, closed for press the price of the QL computer was reduced to £199.99 and the Amstrad CPC664 was withdrawn from the market and replaced by the CPC6128.

Please check with your dealer as to the price of any of the featured machines before making a final purchase decision.



Send your letters to The Editor, Computing Age, Priory Court, 30-32 Farringdon Lane, London EC1R 3AU.

Bad taste

Sir,
If you buy a rotten Apple from a fly-by-night Far Eastern pirate retailer you needn't be too surprised when the 'guarantee' turns out to be an entirely useless document, but it's a different story when the official warranty provided by a reputable hardware manufacturer turns out to be almost as useless.

The manufacturer's warranty on my machine, supplied by a well-established maker of micros, printers and communications hardware, undertook to replace defective parts free of charge for a period of six months from the purchase date. A part duly proved to be defective, and I took the machine back for repairs – and was then presented with a bill for parts, along with the information that I was very lucky not to be paying for labour.

This led to an argument, and the small print on the warranty was examined. 'Ah,' said the manager, 'you see – it says here that "consumable" parts are not covered by the guarantee.'

'Consumable' parts of course are things like disks, tapes and so on, but the company seriously attempted to define them as 'any part that wears out'!

I got my way in the end, after threatening legal action, but this slimy behaviour left a bad taste in my mouth. I should think a lot of people have simply paid up.

It may seem a bit like discussing divorce proceedings at your wedding, but, no matter how thrilled you are with your beautiful new computer, it really is worth it to find out exactly what the warranty covers before you lay your money down.

John Bender
Ipswich, Suffolk.

Horticultural computing

Sir,
Way back in the history of personal computers, mid 1982 to be exact, I decided to buy a Sinclair Spectrum. I bought it to play computer games, but after the initial excitement of these wore off, the Spectrum was in danger of being consigned to the depths of a cupboard for ever.

Luckily a friend of mine suggested a better idea. One of my other hobbies is gardening and at that time I had a large index file in which I kept details of the various plants in my garden and the allotment. It seemed that 'computerising' these records would be an ideal application for the computer. I bought a simple database program and began to transfer the records to the computer.

I was so impressed with the system that I soon added a printer (with interface) and later a disk drive to the computer. I've been quite happy with my Spectrum based system, until recently that is. Everywhere I look nowadays I see reviews of the latest computers to come on to the market, the Atari 520ST, the Apricot F1E et al. My system is beginning to look very out of date.

I am asking, whether in your opinion I should up-grade, and if I do, will this mean that I have to get rid of all my existing peripherals?

J. Masterton
Ingatestone, Essex

There is a lot to be said for keeping faith with your existing set up if you are satisfied with what it offers. You have to consider the cost involved and the time it will take to convert all your existing data into a new format. There is no doubt though that one of the new 16-bit machines will give you a more flexible record keeping system than one built around the eight-bit Spectrum. You also have the advantage that you already own both a printer and a disk drive. These peripherals have standard interfaces which mean that you will be able to use them with any new computer that you buy.

The best advice that we can offer is go along to a good computer dealer. By good we mean one that will be prepared to give a thorough demonstration of a system running a database program that will cope with your needs. If it doesn't show a considerable improvement, then stick with what you've got.

Tired of waiting

Sir,
I wonder if most other followers of this fledgeling home computer industry are boring of the 16-bit debate as fast as I am.

The computer manufacturers still seem to think that we have nothing better to do than listen to their constantly changing hopes and aims for machines which seem to approach almost mythical proportions.

Having waited since Christmas to decide on which of these marvellous machines would be first into Laskeys, I now realise resignedly that I could have sat back in January and predicted every false release date, every confused marketing statement to emerge from Atari or Commodore.

Four years ago I went through exactly the same procedure with the fabulous Acorn BBC. I felt I had learnt my lesson enough not to fall for the tempting promise of the QL – never realised.

I now propose to buy my next computer from the one manufacturer who doesn't need to hype his products for 12-15 months before they are ready. Who always launches on time with full software support and who always finds his way in mass into the high street.

Can you or anyone seriously give me any reason why I whould not buy an Amstrad 6128?
Yours sincerely,

J. O'Hallaran
Hertford, Herts.
P.S. Will your journal be giving support to this machine?

In answer to your first question, no. And to the second, as you will see from this issue considerable space is devoted to the Amstrad range. This is a policy we intend to continue.

User groups

Sir,
I am interested in contacting users of ACT computers, particularly the Apricot/F1/ Portable range, with a view to starting a national user group. The idea would be to cover the full range of computing with things of interest to business, home and educational users. If anyone would like further details please write to me at the address below enclosing an s.a.e.

F. S. Cartwright
'Rockside', 13 Worley Ridge, Nailsworth, Gloucs. GL6 0PD.

Sir,
I am writing on behalf of the 68'Micro Group. At the AGM in May I was elected to the post of Membership Secretary. I am requesting you to print the following details in the next issue of *Computing Age*.

The 68'Micro Group have a new Committee and all Membership enquiries should be addressed to:

Mr. J. Turner,
68'Micro Group,
63 Millais Road,
London E11 4HB.

All other enquiries should be addressed to:

Mr. J. Cunningham,
68'Micro Group,
7 Harrowden Court,
Harrowden Road,
Luton LU2 0SR

The Group is a user group which has it's main interest in the 68XXX CPU's. This of course includes the Dragon and Tandy Co-Co among others. Meetings are held every fourth Tuesday, upstairs in a private room, at the Prince Albert of Cumberland, Albany Street, Regents Park, London. The future meetings are 3rd September, 1st and 29th October, 26th November.

Jim Turner
Membership Secretary,
68'Micro Group.

Next month Computing Age is publishing a survey of user groups – the good, the bad and the ugly. If you are a member of a user group or have experience of one – then please tell us about it. Are they worth the money?

LASER BEAMS AND DATA STREAMS

Compact disks may be read only, but read on. The immense storage space and lightning speed will make a big impact on the computing scene. Peter Luke reports on the new technology.

Mass storage systems based on modified versions of domestic compact disk players are set to offer micro computer users unparalleled performance both in terms of the capacity of a single CD drive and in the ways in which data is stored and retrieved.

Commercial CD peripherals are still some way off but many companies, including Atari, have demonstrated prototype systems that illustrate the potential of this form of storage. One demonstration showed how the text of a complete encyclopædia could be stored on a single CD disk. The entire text file could be interrogated by a flexible keyword search system to locate, for example, all references to the word computer that occured within three words of the phrase compact disk. This example gives some indication of the power of a CD based storage system. The potential of similar databases in research and education will be enormous.

'The ultimate recording density is now limited only by the wavelength of light'

Modified versions of audio compact disk players can be used for data recording. The next step is developing a computer interface.

The design of the audio Compact Disk player resulted from collaboration between Philips, the European consumer electronics giant, and the Sony Corporation of Japan. The system is designed to offer an alternative to the traditional LP record, providing a playback only medium (in computer terms a read only form of storage) capable of reproducing audio signals with the minimum of distortion.

To record audio signals on a compact disk it is necessary to convert the analogue voltages picked up by a microphone into a stream of digital data. This is achieved by feeding the output of the microphone into a very fast A/D (analogue to digital) converter. The parallel data produced by the electronics of the A/D section is then fed to a parallel to serial converter – the result is a very high speed stream of digital data. To get an idea of the speed involved the following (very) rough calculation should help.

LOGICAL EXTENSION

Traditional sampling theory shows that in order to represent an analogue signal in a digital form it is necessary to sample the incoming audio signal at a speed twice that of the highest frequency to be recorded.

In the case of an audio signal, the highest frequency occuring in a typical music signal will be of the order of 20kHz, that is 20,000 audio cycles per second. The signal will thus have to be sampled at around 40,000 times per second. The number of bits per sample is also an important consideration if the resulting digital recording is to be of adequate quality – again in rough terms 16 bits of data are necessary to achieve the desired level of fidelity. Simple arithmetic will now show that an audio CD player must be capable of storing a stream of digital data at around 640,000 bits per second. Translating this sort of data rate into computing terms will show that, allowing for some parity bits, at flat out operation the CD player could store the entire contents of a 64K computer's memory in less than a second. Realise that a single side of a CD disk is capable of storing tens of minutes of audio information, and you'll have some impression of the capacity of such a disk.

'A compact disk player can store up to 640,000 bits per second'

A compact disk can store data at such an impressive density because data is stored using laser light instead of traditional magnetic storage techniques. One of the partners in the CD development consortium, Philips, has for many years been experimenting with laser storage systems. The Laservision video disk system was one product to come out of laser storage R&D work; the CD player was a logical extension of this project.

Many people will be familiar with the techniques used to record computer data on a magnetic floppy disk. Floppy disk technology has shown great advances in the past few years, from a maximum capacity of 160K from a 5¼" drive only a short time ago, to 720K on the physically smaller 3½" disks. These increases in storage density have been achieved in two ways. First the mechanics of drives have been improved in order that twice the number of tracks can be accurately recorded on the same size of drive (80 as opposed to 40). In addition, increases in the density of data storage within a track have been achieved by improving the performance of the magnetic recording head (double density as opposed to what is now termed single density recording). The laws of physics dictate, however, that it isn't possible to push magnetic recording techniques much further.

Making use of a laser beam to record data increases potential recording density by several orders of magnitude. Data is now stored as a series of pits (sometimes bumps) burned into the ultra smooth surface of a specially prepared disk. The wave length of light now becomes the limiting

factor in ultimate recording density, rather than the characteristics of a magnetic recording head.

RANDOM ACCESS

Exact details of the systems used by the various manufacturers working on CD storage systems will have to wait until these products are nearer to commercial reality. It is likely though that systems similar to those used in video disk players will be adopted. Video disks are recorded in one of two formats.

One format adopts a system similar to an ordinary LP disk; that is, the digital information is recorded as a single, continuous spiral starting at the outer edge of the disk and continuing in an unbroken path until it reaches the centre. This format is used to record data that is unlikely to be retrieved on a random basis, for example a recording of a film would normally be viewed as a continuous stream of data, ie frame after frame.

The other video disk format owes more to the recording system used for magnetic storage disks. This system records data in a series of discrete, concentric circles covering the surface of the disk. In a video disk player, each of these 'tracks' represents the information contained within a single video frame. The advantage of this format is that it is possible to record a track identifying signal as part of the information on every track. Control electronics makes it possible to send the playback head to the exact position necessary to retrieve data from a specified frame. This system is the one used in interactive video disk systems such as arcade games. It offers random access to data.

Random access is an important feature of a computer mass storage system, so it is likely that CD systems will adopt a concentric track rather than continuous track recording format.

FASTER SPEED

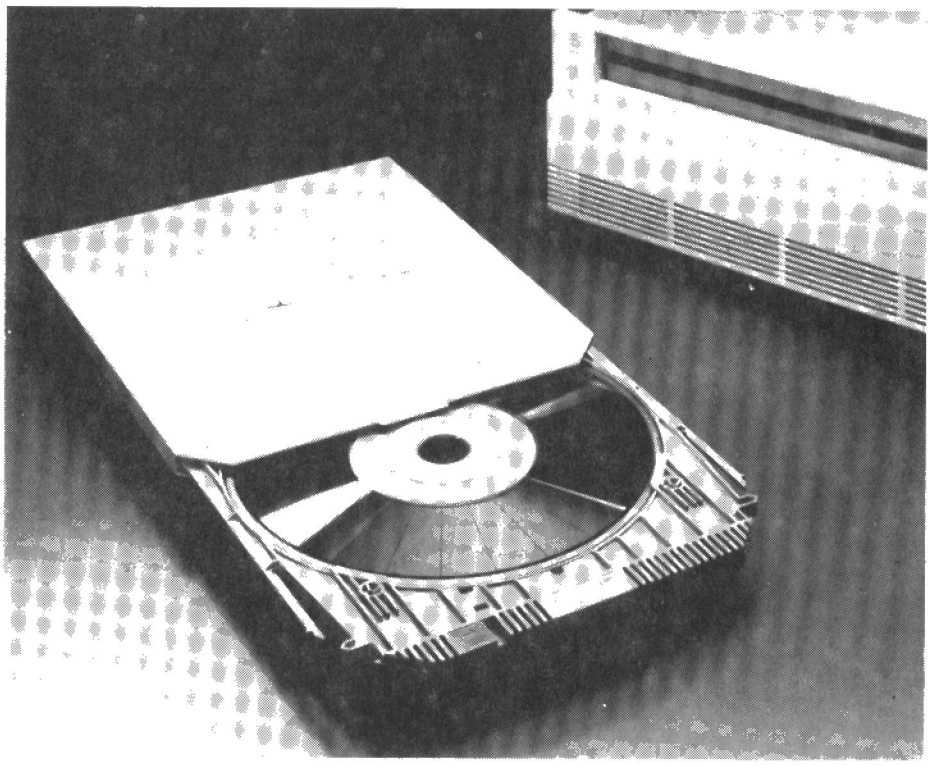
The major problems in implementing the hardware of a CD storage system have been solved. The techniques of storing high density digital data have been overcome by the designers of the audio CD system. Techniques for random access of digital data stored on disks can be borrowed from video players. Details of the interface unit required to link a CD storage system to a micro computer have yet to be released by the manufacturers but it is likely that they will adopt an architecture similar to that of a hard disk interface. Data transfer will in the case of a CD unit be in one direction, the CD disk being a read only storage media. Transfer of data will be on a DMA (Direct Memory Access) basis, in order to achieve the high rates of data transfer required.

The main task of the interface unit will be serial to parallel conversion of the data output from the disk drive into the byte orientated information required by the computer. An interface unit will also have to pass control information between the computer and the drive. In addition, any system designed to check data integrity, parity bits etc, may be handled by the hardware. Once again this ensures that the transfer of data is at the fastest possible speed.

Designing the hardware of a CD system then, is a matter of extending existing techniques. The biggest problem remaining is to find methods of organising a mass of data so that it can be readily retrieved.

The encyclopædia database mentioned above used only 40% of the total capacity of the disk, and of this only 20% was devoted to storage of the text: the other 20% was taken up by the indexing software. This illustrates the importance of the software to control the operation of CD data players.

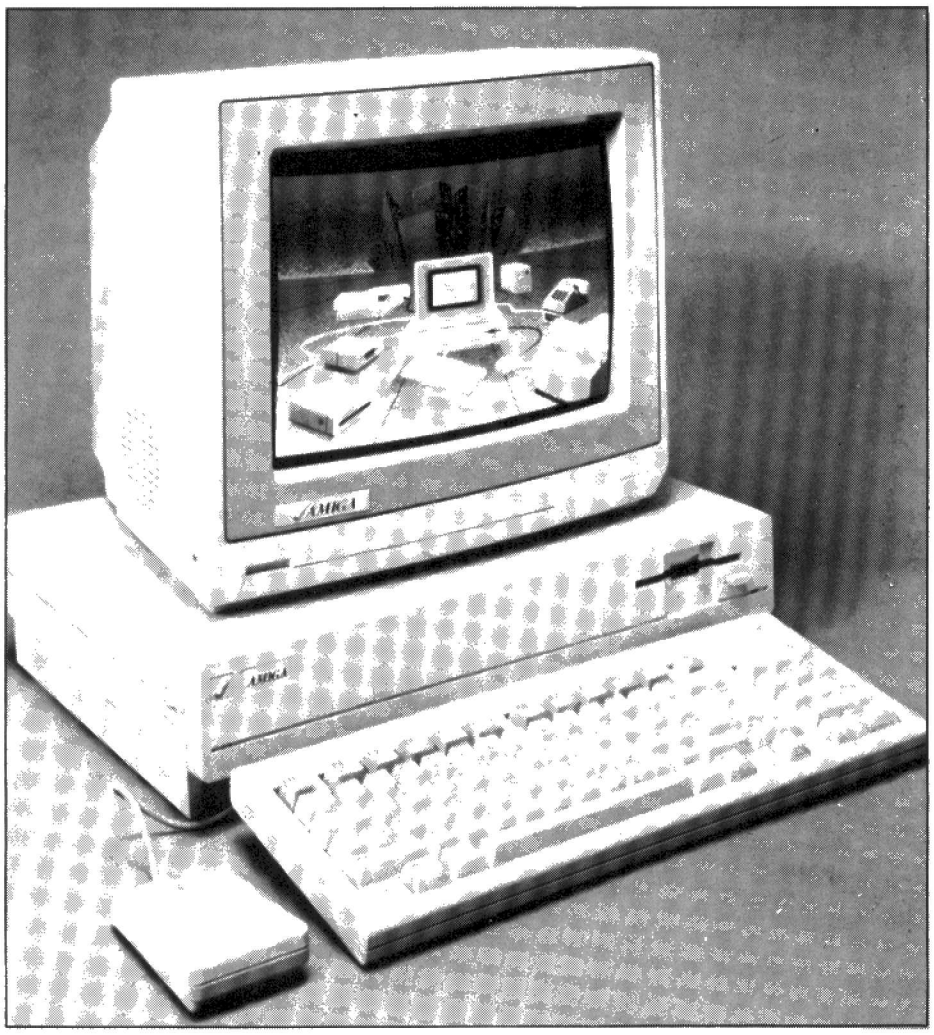
A logical extension of the use of CD drives to store text and graphics information is the integration of an interactive video player into the system. The video player could be used to store high resolution picture images that related to text based information. In the context of an encyclopædia, the obvious advantages of such a combination are obvious – text illustrated by diagrams and pictures. Once again the technology to realise such a system is available today. It is only necessary to produce suitable software in the form of CD data disks and laser video disks.



Optical recording is already available for business. The Optimem 1000 CD ROM stores one billion characters of information (one Gigabyte) on one side of the removable 12 inch disk – the equivalent of 400,000 typed pages of text. To write to the disks a high-power pulse is generated by a laser. The energy from this pulse melts a specific area in the recording layer, creating a hole and exposing a lower, more reflective area. During a read operation the media is illuminated continuously by the same laser operating at lower power. Higher reflectivity is interpreted by the drive as data one, low reflectivity as data zero. 12" drives will, says Optimem, become an industry standard, but it is just as likely that we will see low cost drives (this one isn't cheap – it costs £4770) based on the current 5" audio format.

'The biggest problem left is how to retrieve the mass of data available on disk'

'Interfaces will adopt an architecture similar to that used for hard disk systems'



GET LO

The Commodore Amiga makes the Mac look expensive and the Atari ST series old fashioned. It won't be on sale for six months but Adam Denning and John Gilbert got a sneak preview.

The hardware

For a target price of £900, or $1200, the Amiga is an outstanding achievement for its creators. Its hardware specification shows that it is technically head and shoulders above any kind of competition.

A 68000 acts as the CPU, controlled by the AmigaDos operating system in a 128K ROM chip. The standard RAM memory size is 256K but it can be boosted to 512K using expansion boards which slot into the front of the computer's box. Although the 68000 can only handle 0.5Mb the Amiga's memory map is configured to allow RAM expansion up to 880K.

The keyboard is detachable. It has 89 keys with a numeric pad on the left, a full sized space bar and 11 function keys.

The main array of interfaces and output ports is at the back of the box. They include twin joystick ports, an RS232 for serial communications, a stereo output channel, disk port, RAM expansion port and a Centronics parallel interface. Also included are connections for RGB and television. No monitor is supplied with the machine as standard but for another $300 Commodore Amiga will supply one. The television connection may prove a necessary stopgap for some people, but the display quality is poor, especially if you have seen the machine working with a monitor.

Although the Amiga has an excellent operating system it relies heavily on its hardware for speed of operation.

Most computers, such as the QL and ST, use software not only to drive hardware but also to create graphics and sound effects which would be better done by dedicated processor chips. The result is that a lot of CPU time is used up and programs are slowed down.

CUSTOM CHIPS

Commodore Amiga, however, has made no software dodges in its new machine. The 68000 chip at the centre of the computer is released from memory management, graphics display co-ordination, and peripheral control by three custom designed chips.

Portia, Agnus and Daphne are the stars of the Amiga circuitry. Agnus controls memory processes using 25 Direct Memory Access channels – DMAS. It also controls screen output using the bit-image manipulator, the Blitter, which can be used to manipulate blocks of general RAM into and out of the screen RAM. All the CPU has to do is give the Blitter an instruction to move a block of memory and it is done. The 68000 is, therefore, excused the type of tasks that it would have to do in machines like the Spectrum or QL and it's more efficient as a result.

The Blitter is aided in its task by a built-in co-processor called Copper. This processor handles the attributes of the display such as which display mode the machine is currently in and what is to be shown on the screen. It also sets up the machine's sprites which are hardware based. The sprites, colour graphics commands and window generation are all, of course, tied up by AmigaDos using a presentable user interface.

The Portia chip is responsible for the mian-line input and output handling. It controls the sound system and takes information from the mouse for use by AmigaDos. The sound output hjas four channels, with a range of nine octaves. Output is internal, through the front of the machine, or it can be sent to external speakers. The result is a sound system which will appeal to computer programmers and audio enthusiasts. Through AmigaDos, Portia can also produce male and female speech of a high standard.

As well as handling sound Portia deals with the mouse and disk system. The mouse is plugged into one of the joystick interfaces and has two clicking switches on its back. The chip receives the raw material gathered by the mouse which is then refined by the operating system.

The Amiga has one 3.25" disk drive built in, with a formatted capacity of 880K. Another drive can be added by using the disk port at the back of the machine.

Daphne is the third of the custom chips. It has close ties with Agnus as it produces the animated features of the Amiga display. It handles output from Agnus and adds its own input including colour manipulation and sprite animation.

Those three chips form the power base of the Amiga and, acting as intelligently as chips can, take away all of the mundane tasks from the CPU.

JOHN GILBERT

ST MACINTOSH

The software

The Amiga has been designed very much with the future in mind. Unlike other computers purportedly in the same genre, the Amiga will have a fair degree of software available at (UK) launch. The substantial part of this is development software, such as compilers and assemblers, but numerous software houses with successful and popular titles have indicated that games will follow very quickly.

Obviously, it's a good move letting the compiler writers get in there straight away, as it allows the applications programmers to get on with their tasks without needing to worry about how they can get the code onto the new machine. One major factor in getting this software so close to readiness is Commodore and Metacomco's willingness to release details of the Amiga's firmware.

'Sprites, colour graphics commands and window generation are all tied up by AmigaDos'

The operating system was written by Metacomco of Bristol, and is essentially the Tripos operating system re-written. Tripos is one of the by-products of the Martin Richards industry. This professor of computing at the Cambridge Computing Laboratory (part of the University) was responsible for the BCPL language, and therefore had a very large hand in the development of C, as Dennis Ritchie used BCPL as the basis of his new language. Another of Richards' developments was a multi-tasking operating system, which was christened Tripos. This is written almost entirely in BCPL, and was brought by Dr Tim King to Metacomco. There it was adapted for early 68000 machines such as the Sage, where it was sold in reasonable quantities. For reasons best expressed as IBM, Tripos never really got the exposure it deserved. It was one of the earliest small machine operating systems which was capable of both multi-tasking and multi-user support, although it needs a fairly hefty processor for usable results.

IMPRESSED

Commodore Amiga was writing its own operating system for the new machine, but asked Metacomco to adapt Tripos for it as a 'back up', in case something went wrong. Due to Tim King's perspicacity, the new Tripos was finished well before Commodore Amiga's system, and the company was so impressed that it dropped its system and decided to adopt Tripos there and then. Its new re-incarnation is officially called AmigaDos, but it isn't difficult to see that it is very much Tripos-based.

Tripos/AmigaDos is one of the friendliest operating systems around, even having a WHY command to expand upon error messages whenever something goes wrong. It is well-suited to multi-tasking, to the extent that its own command line interpreter, the CLI, can carry out multiple executions from within itself. When this is done, each new CLI has a unique number in its prompt; the first is 1>, the second 2>.

But there's more to the Amiga than AmigaDos. Underneath this is the collection of device drivers and hardware interface systems which look after things like the disk drives, the screen and the serial port. Each of these drivers is seen by AmigaDos as a separate task, so that even if nothing appears to be happening the device drivers are keeping track of their bits of hardware.

This allows you to do silly things like remove disks and swap them with others. AmigaDos soon notices, and asks you to replace the original disk (or indeed, whichever disk is required at that point) at your convenience. But that isn't the really clever bit. The really clever bit is that these disks can be put into a different drive to that which they came from, and AmigaDos handles it without even blinking. No more of this:

Disk not ready in A:
Abort, Retry, Ignore?

DESKTOP

Also coming as standard with the system is the Workbench, Amiga's answer to the GEM desktop. It performs much the same functions, allowing disks to be examined, programs to be executed and windows to be opened. Unlike GEM, though, it can multi-task, and its presence is entirely optional. Programmers, reckons Tim King, would prefer to enter the CLI directly, while the user is more likely to start with the Workbench and take it from there.

The Workbench is more versatile than GEM and the Mac in other ways, too. Selected icons may be removed from their disk windows and placed in arbitrary positions on the desktop, which allows you to select the icons you want rather than being forced to have the whole lot. Windows may of course overlap, but unlike these other systems Workbench lets you switch windows in front or behind each other at will. The old concept of a 'current window' will soon be dead, it seems, as all windows may be current.

'The old concept of a current window will soon be dead – all windows are current'

Then there is AmigaBasic. This is a derivative of Metacomco's earlier 8086 product, Personal Basic, which is marketed by Digital Research. It's an interpreter, which may sound bad at first, until you realise that on the Amiga it doesn't make a lot of difference. The interpreter has built-in routines to access all the special features of the Amiga, including the famous Blitter and the speech synthesiser. Dr King

When software house Metacomco gave Adam Denning and John Gilbert a call to come down to Bristol to see the Amiga, they jumped at the chance.

There had been no shortage of intriguing rumours to whet the appetite, and when it came to seeing the real thing neither scribe was disappointed, quite the contrary; they had never seen anything to compare with the Amiga's video and sound handling facilities. An excellent operating system and brilliant custom chips do things which other machines can only achieve with system clogging software.

Amiga is fast and very effective, superslick to use whether in standard operation, graphics or special abilities like speech synthesis – to the extent that the competition pales. In fact, there is no competition for this machine, there's nothing else like it.

Yet, while a lot of people are going to see it that way, there are other things to consider when it comes to laying down your money. Amiga is a better machine than the new Atari 520ST, but it must be considered that a 256K Amiga with colour monitor is twice the price of a 512K ST with a mono monitor and bundled software. And software support for the Amiga is in question – it is not PC-compatible, and, as yet, has no wordprocessing, spreadsheet or communications software, though an add-on (for $500) is promised which it is claimed will run IBM PC programs directly, and plenty of games programs are offered.

Essentially, the two machines are different. The Amiga's amazing graphics ability (it can synchronise with video images) point it at a wide specialist market: architects, video and film producers, CAD, typesetting, and engineering and technical applications. But this doesn't dampen its appeal for home and business users – it is, after all, the most interesting machine around.

demonstrated a few programs, none more than 15 lines long, that produced and animated graphics the likes of which even the Mac programmer has to enter machine code to produce. The Basic interpreter can be used to write graphics programs which run as fast as their pure machine code counterparts on machines like the

'The really clever part is that a disk can be replaced in a different drive – and Amiga won't even blink'

Spectrum, Amstrad and BBC Micro, with one proviso – none of those computers could hope to match the graphic ability of the new beast.

SOUNDS

Also accessible from the Basic interpreter is the sound function library, which has wonderful routines like 'translate' which takes a typed-in text sentence and converts it to phonemes ready to be fed into

'The 68000 is excused the type of tasks it would have to do in other machines and it's more efficient as a result'

the speech synthesis unit. Each parameter can be altered by wide degrees, and it isn't at all difficult to get fairly reasonable male and female voices out of your computer.

Sampled sound data format is 'Fairlight compatible', which means a lot to musicians. The Fairlight is a highly complex sound sampling synthesiser/emulator sort of thing, currently very much in vogue for its ability to let you play Terry Wogan's voice back at any pitch you fancy. Musicians use it, too.

Finally, the software which is not supplied as standard but which already exists. From Metacomco, there is the macro assembler, linker, ISO Pascal and Cambridge LISP packages, all of which are highly respected. The LISP is able to both interpret and compile LISP programs, which means it can execute programs at very impressive speeds. The Pascal compiler, although it has been ISO validated on other Tripos 68000 machines, is to be taken through the suite on the Amiga. Just for extras kudos, I suppose.

Lattice has implemented its justly famed C compiler on the machine, and Borland has produced its wonderful (in Pascal terms) Turbo Pascal compiler.

ADAM DENNING

THE PRINTING ELITE

Epson's latest dot matrix printer is a big step up from the FX80 – but doesn't cost much more. William Owen reports.

The LX80 is the first low cost NLQ (near letter quality) printer to come from the very popular Epson stable. Before you see the printer look at the advertising. It gives a very good impression: the print quality looks superb on the printed page. The first conclusion is that mutually exclusive features have been united in one machine: the print quality of a daisywheel coupled with the low cost, speed and quiet operation of a dot matrix, and of course Epson reliability and compatibility.

But that odd phrase 'near letter quality' is nothing more than an admission by manufacturers that they have yet to develop a dot matrix printer to match a daisywheel for quality. They're close, but as a miss is as good as a mile this machine turns out to be a slight disappointment.

If you compare the two print examples shown in the illustration – one generated by a daisywheel and the other by the LX80 – you will see that what is in effect a 12 x 18 matrix cannot produce true letter quality.

So we still have a compromise, but an exceptionally good compromise. Anyone to whom letter quality is a necessity should examine low cost daisywheels such as the Quen Data DW1200 which retails at the same price as the LX80 but is slower and noisier. If you don't need true letter quality but are dissatisifed with standard Pica or require an exceptionally versatile low cost printer, then read on.

MULTITUDE OF FONTS

The SelecType function gives no less than 12 fonts selectable from the LX80's front panel switches. These are made up of combinations of Draft Pica (the FX80 font), NLQ, and Elite, with compression, emphasis and double-strike. By using control codes within a text further variations such as enlarged printing, bold, underline, italics, subscripts and superscripts can be obtained (that's if your word-processor supports control codes). The same effects can be produced from within Basic.

Compressed pica gives a total of 132 characters across an A4 page, and compressed elite gives 160, so both will be of benefit to spreadsheet users. Sub and superscript modes give half size characters – it's the real thing – and the enlarged bold expanded is a useful headline face. But most of the other fonts obtainable from control codes are a licence to commit bad taste.

NEW FEATURES

Print speed varies according to which font is used. NLQ and text variations require two, sometimes four passes of the printhead, which substantially reduces the standard rate of 100 characters per second. Two passes are required because the bidirectional 9-pin head can only create an 12 x 18 dot matrix if the paper is shifted by the platten.

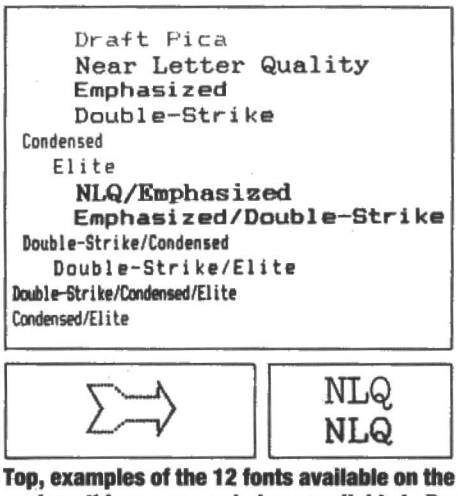
The LX80 makes three major improvements on the FX80. The most obvious is the bigger range of fonts and in particular the near letter quality font. The second is the facility to create user-defined characters: for example the arrow illustrated, which was created from a Microsoft Basic program listed in the excellent Epson documentation. Designing one character would take most users about 15 minutes – so it's not the sort of thing you would want to do every day but could on occasions be most useful. The full character set is 96 Roman and 32 special graphics characters. The graphics characters can be used to produce pictures, graphs or charts, or large lettering. They replace the standard letters and symbols used to produce graphics on older models. The manual gives a clear explanation of how to generate graphics (from MBasic – easily adapted to other dialects) and gives some useful programming tips. Users of BBC Basic, CP/M, GWBasic, and Apple Basic are given short explanations of how to adapt programs to their machines.

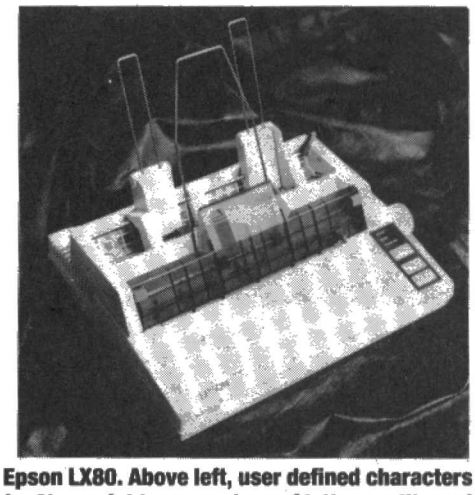
The LX80 is not sold as a complete unit – it lacks a tractor feed which is sold as an 'optional' extra. Users of continuous spooled paper sheets (nearly everyone) will have to pay an extra £20 plus VAT for the tractor unit which fits neatly into two sockets at the top of the machine. A tractor unit is an essential, not an option, and it is irritating that Epson have excluded it. That said, we tried our review machine without a tractor feed and it was possible to feed through continuous paper without it slipping out of true – too often.

The last point to raise is the printer's looks, concerning which there are no complaints. The design is simple, sensible and attractive, and there are no obvious errors or weak points. Epson printers are noted for their reliability and there is no reason to suspect that this one will be an exception – we gave it a hammering and it suffered no ill effects. The LX80 can compete with any other printer in this price range. It is fast, flexible, and gives superior print quality – for a dot matrix. Definitely good value for money but think twice if you need genuine letter quality print.

Data

Printing method	Impact dot matrix
Printing speed	100 cps
Printing direction	Bidirectional, logic seeking
Interface	Centronics
Character set	96 Roman, 96 italic, 32 international, 32 graphics
Fonts	Pica, Elite, NLQ, Compressed
Ribbon	Cassette, black carbon
Weight	11.5 lbs
Price	£259 + VAT (optional tractor feed £20 + VAT)





Top, examples of the 12 fonts available on the Epson LX80. Above left, user defined characters such as this arrow symbol are available in Basic. Above right, comparison of letter quality and not quite letter quality; guess which is which. Right, the machine in question.

COMMS NEWS

The latest information for on-line enthusiasts starts our eight page communications section.

Amstrad database October launch

Amstrad users will soon have access to a database geared specifically to their needs. Micronet 800 and Viewfax 258 have tailormade their new database to Amstrad 464 and 664 computers.

The new service will be launched on October 4 at the Amstrad Computer User Show, and a sample will appear on the Micronet demonstration area for free access by anyone with a 1200 375 modem.

Managing director of Viewfax Lindsay Reid said: 'Despite the recent problems for companies such as Acorn and Sinclair, the new Amstrad micros are proving to be highly successful and there are not sufficient users to warrant the launch of a new database.'

Also at the Amstrad Computer User Show, Skywave software will launch its new 'Skycom' communications package enabling Amstrad users to connect to the new database.

An alien in the mailbox

A report in the business newsletter Fintech has caused red faces at Telecom Gold. Fintech editor Peter Knight described himself as 'shocked and annoyed' when he found that his personal Gold mailbox had been entered by an intruder.

Fortunately, the 'alien' was friendly, merely leaving a message to declare his presence. But nevertheless Peter Knight was disturbed enough to report the incident, and was told by a Gold system manager that it was not unprecedented.

The intruder, a regular Gold user, was reported as saying that he regularly found himself dumped into private mailboxes.

'I could have done anything I wanted to the mail in the boxes,' he told *The Sunday Times*, 'but in fact I just left messages.'

According to a Gold spokesman, the problem has been traced to a faulty modem – now rectified. But the difficulty may stem from a glitch shared with Prestel – the fact that subscribers who log off without going through the recommended procedure may leave an open line behind them.

Almost immediately, the line will be detected by the system and closed down, but in the interval anyone dialling in can pick up this line and find themselves already logged on in the original subscriber's ID.

But neither Gold nor Prestel should get all the blame for this form of poor man's hacking.

Too often, comms users take less care of their IDs than of their credit card numbers or car keys, and although an unceremonious dumping from the system can be caused by noise on the line, in most cases the fault lies with lazy subscribers who'd rather pull the plug on their modems than go through a couple of seconds' worth of log-off procedure.

Prestel heads for the black

Prestel isn't saying it in public, but BT's Viewdata division hopes this year to move into profit. These hopes are based on a growing subscriber base spending more time on the system – and on a piece of smart accounting.

The accounting comes from a decision by BT management to erase from Prestel's balance sheet the costs – estimated at £50m – of establishing its network of local call access for 92% of telephone subscribers.

Richard Hooper is the man who sits in the BT management pyramid at the point where Prestel, BT Gold, and other value added networks unite. His key decision that the local call system built up by Prestel should be shared by all the BT networks was not greeted with wild enthusiasm at Prestel – which saw the move as allowing competing systems to capitalise on its own foresight.

But now comes Prestel's compensation – £50m waived from its accounts, and potential profitability, after six years of operation.

VTX modem goes back to higher price

One of the best bargains in computing has come to an end. On September 10 the VTX5000 modem for the Sinclair Spectrum returns to its old price of £69.95 after a months-long offer at a knock-down £49.95.

Vendor Modem House was able to sell the device so cheaply thanks to its purchase of warehouse stocks from the defunct Prism distributor. But after sales 'nearly into five figures', Modem House boss Keith Rose has exhausted the ex-Prism stock and plans once more to commence VTX5000 manufacture – probably at Race Electronics in Swansea – and to re-instate the old price.

Since its Micronet-assisted launch by OE Ltd a couple of years ago, the VTX has become the standard comms unit for the Spectrum, forming the heart of user-to-user groups and spawning software patches to remedy its imperfections – notably scrolling software available for a couple of pounds as downloadable telesoftware from Micronet and giving Spectrum owners access to the big US databases.

So the VTX price rise will come as a relief to manufacturers who've been waiting in the wings with alternative devices for the Spectrum, unable to launch while the Modem House offer hogged the market.

Most notable of these is Miracle Technology, which has acquired rights to the Monflair CTE-80 modem interface. This device, likely to cost around £50, will provide the Spectrum with a true RS232 port (unlike the software-driven, printer oriented excuse for an RS232 on the Spectrum Interface One) capable of linking the micro to a wide range of commercial modems.

Miracle, incidentally, has just launched a similar modem interface for the QL – a machine whose ineffective serial ports again illustrate Clive's penchant for penny-pinching. At just over £30 the interface gives QL owners an alternative to the £170-and-upwards cost of the modems from Tandata and (again) Modem House.

But Sinclair groupies upgrading from the Spectrum should beware. The QL interface won't work with the distinctly non-standard VTX5000.

Pre-packed Viewdata move 'doomed'

The inside info is that Prestel is once again trying to persuade TV manufacturers to put Viewdata circuitry inside their sets.

If successful, such a move would give Prestel the same immediate access to the home market as teletext TV sets have given Ceefax and Oracle – and allow TV advertisers to cite a Prestel page for ordering and further information with the same abandon with which they currently refer viewers to 200 0200.

But Prestel mounted a similar campaign of persuasion at the TV manufacturers several years ago, and observers inside the industry are already saying that the latest attempt will be equally unsuccessful.

'TV manufacturers have only been reconciled to putting teletext into their sets because TVs nowadays already contain digital circuitry to handle the remote control units, and because teletext – being a TV signal – isn't vastly different from what they have to handle anyway,' said an industry source.

'But Prestel's low frequency input would be a completely different job, and I can't see it being possible without adding greatly to the cost of a set.'

LOG ON TO GOLD

You've heard of Prestel, you've heard of Micronet. The next big thing in micro communication will be Telecom Gold. Clive Williamson explains the hows, whys and price of logging on to Gold.

At a time when most computer sales have been in the doldrums, there is at least one area that is definitely whipping up a storm! Throughout this summer there has been a steady sale of communications software and hardware, as more and more people have caught the telecommunications bug and connected their micros to the telephone line.

The trend looks likely to continue, as micro users in both the home and business turn towards this readily accessible and very concrete use of their computer equipment.

The attractions are many: with the right equipment and software a microcomputer user at home can gain access to electronically published micro magazines, the PRESTEL database, free computer software, mailbox, teleshopping and banking facilities. For the business user, countrywide (and even world-wide) file transfer is possible, along with telex sending and receiving, access to up to the minute reference 'libraries' of data and the establishment of private viewdata systems, similar to Prestel but giving privacy to closed user groups. And all down the phone line!

Most businesses have to pay for new equipment to make use of the extensive facilities offered by this form of communication; the modern micro enthusiast already has most of the necessary hardware at home. The main elements are a VDU or TV screen and a computer keyboard. The only extras required to connect these to the telephone line are a MODEM (short for MOdulator/DEModulator) and specific software for the computer to turn it into a 'terminal' that can send, receive, and display text, and possibly graphics as well. Costs are coming down all the time, and it is now feasible to begin telecommunicating for as little as £100.

A great number of micros are already supported with suitable software, including ACT, Apple, BBC, Commodore, and the Sinclair QL and Spectrum machines. Some new models (like the flavour-of-the-month Atari 520ST) come with terminal software already built in.

WHAT DO I NEED?

In order to use a micro to communicate directly with a service like British Telecom's Prestel, or Telecom Gold, some form of adaptor is necessary. This can take the form of either a modem or an acoustic coupler, which acts as go-between, and must be connected to the micro via its RS232 or RS423 interface.

The acoustic coupler makes an acoustic connection between the interface and the telephone handset. This method of linking to the phone line has the great advantage that it does not need British Telecom approval, but it can sometimes give bad connections under difficult line conditions. The effect is seen as spurious characters on the screen, generated by noise on the line.

Modems, on the other hand, do need BT approval because they make a direct or 'hard wired' link with the phone line, but they are much less likely to suffer interference, and generally give a more reliable connection with the computer at the other end of the line., Neither modems nor acoustic couplers are machine specific – the important thing is to have the proper lead made up to connect them to your machine.

'Telecom Gold looks set to become the next cult computer application'

Additionally, software is needed to decode the signals coming from the modem, and to establish two-way communications between it and the micro. This software is always sold specially for a particular computer, or type of computer. It needs to be suitable for the type of database you intend to communicate with, because the data transmission can be in different formats. Prestel uses standard 'Teletext' alpha-numeric and graphic codes, while Telecom Gold uses ordinary ASCII characters, but can send and receive them at a variety of different speeds.

Each character sent down the line by the database or 'host' computer is coded into a series of tones, in much the same say that the cassette interface on the micro would operate. In the case of the Prestel 1200/75 standard, data is sent from the Prestel computer at a rate of 1200 baud, or about 120 characters per second, while responses typed in at the micro's keyboard are sent back at 75 baud. This is only seven characters per second – a slow standard – but was chosen to reduce the number of errors resulting from poor phone connections.

The overall effect is that pages of data are sent very quickly from the Prestel computer, while alpha-numeric data is sent back from the micro at a more sluggish rate to request pages, or to send short letters or telexes over the system. Telecom Gold can handle three different rates of data exchange: the Prestel standard 1200/75; 300/300; or 1200/1200. Most modems can now be switched between the first two rates: the last option is rarely found on the cheaper units.

DOWN THE LINE

British Telecom's public Viewdata service, Prestel, is a database of 300,000 pages of information stored on several computers around Britain. The pages used to be viewed or 'accessed' over the telephone line using a special Prestel receiver, or an ordinary television set fitted with a Prestel adaptor, but now they can be accessed just as easily using a home micro. The BBC Model B is particularly well suited here, as its Mode 7 display uses the same Teletext character set as Prestel. Each Prestel page – usually a mixture of text and low-resolution block graphics – has a unique number, and can either be viewed by entering that number directly on the keyboard, or by following through a tree-like structure of menus.

Once connected or 'logged on' to the system, the structure is very easy to use and usually enables you to 'search' for particular items rapidly. The great advantage of using a micro is that its alpha-numeric keyboard enables text messages to be sent instantly to other subscribers on the system using 'Mailbox' facilities, and it is even possible to send telexes. Information held on Prestel includes up-to-the-minute details of travel, weather, city news, current affairs and sport, and special services which often cost extra.

As usual, out comes the old cheque book, because a subscription charge must be paid for the use of Prestel. This is currently £6.50 per quarter for private users and £18 for business users. During office hours there is an additional charge of 6p per minute for using the system. A large number of companies and public bodies act as 'information providers' to the service, and most of their pages are free.

Commstar ROM screen

One of the menus from the highly versatile COMMSTAR software by Pace – a plug-in ROM for £29.57 + VAT which converts the BBC Micro into either a Prestel receiver or a Telecom Gold type terminal when used with a suitable modem. Nice features include a real-time clock in terminal mode, so you know in advance how disastrous the phone bill will be, and the facility to 'tag' pages of interest when logged on to Prestel so that they can be found again later in the session.

COMMUNICATIONS SOFTWARE

COMPUTER	PACKAGE	PRICE	SUPPLIER	COMMENTS	TELEPHONE
ACT	Tan-link	£149.50	Tandata Marketing	Includes cable	06845 68421
Amstrad	Micropack	£99.95	Modem House	Includes modem	0392 69295
Apple II IIC/IIE	Vicom	£150.00	AM Technology	—	01 589 4642
Atari	Multi-Viewterm	£59.95	Miracle Technology	—	0473 50304
BBC B	Commstar Communicator	£34.00 £69.00	Pace Computer Concepts	— Not Viewdata	0274 729306 0442 63933
Commodore 64	64 Micropack 64 Terminal	£48.30 £39.00	Tandata Marketing Tandata Marketing	— Extends terminal facilities of above	06845 68421
IBM	Tan-link	£149.95	Tandata Marketing	—	06845 68421
Macintosh	Vicom	£150.00	AM Technology	—	01 589 4642
Sinclair QL	Q-CONNECT QL Bright Star	£89.95 £199.95	Tandata Marketing Modem House	— Includes modem	06845 68421 0392 69295
Sanyo MBC550	Mi-Term	£69.00	Northwest Computers	—	061 434 9747

Electronic mail

A different approach to Prestel is offered by 'Telecom Gold', British Telecom's electronic mail service. This is a two-way service aimed particularly at groups of business users, but which is also available to individuals. It is currently arousing a great deal of interest among micro owners and looks set to become the next 'cult' computer application. The system allows text files to be written, edited, filed, sent and received via a telephone link. The service is not confined to Britain, as the system has links to similar telecommunications networks abroad. As with Prestel, special terminal software is needed to use Telecom Gold, but that software is generally easier to write, as it does not rely on displaying the Viewdata text and graphics format. Hence there is now plenty around for a range of micros, including BBC, Commodore, IBM, Spectrum, QL, Tandy, Apple and Macintosh.

LOG ON TO GOLD

To use the Telecom Gold facilities it is necessary to enrol and obtain a Network User Identity (NUI). The initial payment is £40 for an individual mailbox, or £300 for a business account with unlimited mailboxes. After that, there is a minimum monthly charge of £10 for individuals, and £100 for businesses, with computer time charged at a set rate of 10.5p per minute during office hours (between 8am and 7pm weekdays). Users outside that period only pay 3.5p per minute. All the prices exclude VAT.

BT Gold's main strength lies in the way it can be used to send ASCII files of text from one location to another almost instantaneously. Once they reach their destination, there is no need for them to be re-typed – so often a problem with written information! The text files can be short memos (prepared on-line and addressed automatically either to one other mailbox on the system, or many) or they could be longer, more ambitious pieces such as articles, reports, newsletters or sales data. These complex files can also be written on-line, using the Telecom Gold computer's store, edit and spellcheck facilities if required, or (more economically) they can be prepared off-line on a word processor, then 'spooled' down the line through the terminal software, thus saving a small fortune in both Gold and telephone charges.

A 1200/1200 baud rate keeps costs down to a minimum, but most of the cheaper modems will only handle 1200/75 and 300/300 rates, in which case it is a good plan to use 1200/75 baud to receive your messages, spooling them onto disk as they come in, then log off to read them. Having written and edited your replies on a suitable word processor, make a second call to the Gold computer at the 300/300 rate to send them back. I have successfully adopted this system to send View and Wordwise Plus files from a BBC 'B' using the 'Rolls Royce' of communication software for the Beeb, 'Communicator' by Computer Concepts (£69) and a Minor Miracles WS2000 modem. The process can be further simplified by using an Auto-dial option for the modem controlled by the terminal software.

GOING ABROAD

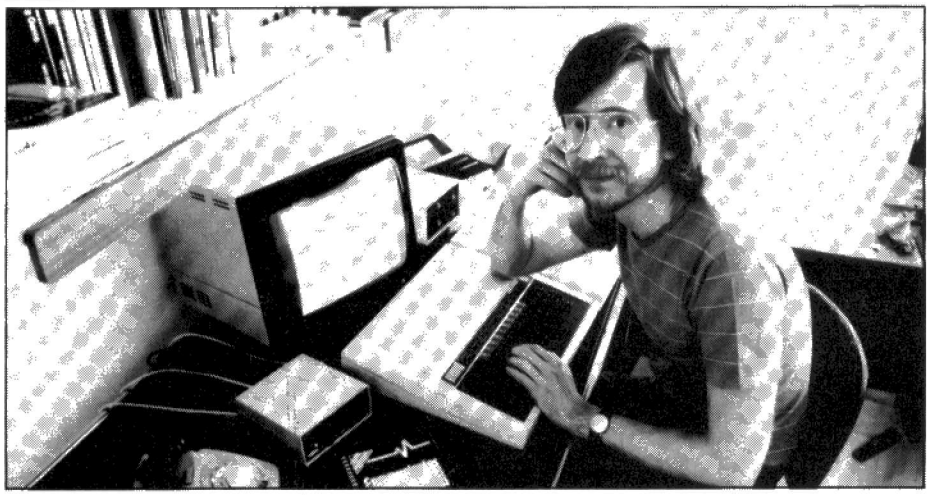
An important plus for the Telecom Gold system is the fact that access can be made to it from abroad with a local call, as long as you have the necessary equipment on hand, and a user identity on the local system. Messages can be sent from one country to another whenever it is convenient, thus removing the problems of differing time zones, to say nothing of the costly delays usually experienced when waiting for busy switchboards to connect you in person. Using electronic mail, data can be sent thousands of miles to be read immediately or at leisure. The response, or revised version, can be returned just as easily.

'ASCII files can be sent from one location to another almost instantaneously'

Newer facilities have made Telecom Gold an even more efficient business tool. Incoming and outgoing telexes are now catered for, and a Diary option can give

The Nightingale Modem from Pace

Simple but effective: Pace's NIGHTINGALE modem offers switchable 1200/75 and 300/300 baud rates, as well as a 'reverse Viewdata' 75/1200 mode so that you can start your own database, or send software to friends over the phone. Price: £119 + VAT. An optional auto-dial/auto answer board is available.



Clive Williamson is a regular user of Telecom Gold.

specified mailbox holders access to someone's appointments diary, allowing it to be updated and monitored remotely, without losing the privacy of the mailbox in question. There is also a free option for those with BT Radiopagers giving automatic paging whenever a new message is waiting.

The latest development is 'Microlink', a service run by Database Publications Ltd, giving low-cost entry into Telecom Gold and special user rates, so there should be increasing opportunities for hobbyists to make sensible use of their micros as telecommunications devices as more and more people register on the system. Unfortunately, Microlink payments must be made by direct debit either from your bank account, or from your Access or Visa credit card account.

THE FUTURE

Telecommunication is already playing a vital role for some deaf subscribers, who can use the 'chat' mode on Telecom Gold to 'converse' over the phone for the first time, and a special rate from Prestel allows educational users to broaden the curriculum to include telecoms. It seems likely that information services will diversify, and become more important, particularly when cable television is introduced and more systems can be set up to work down the cable network. 'Telephone researcher' could become a new job title. Eventually the computer links will be made between authors and editors, reporters and publishers, sales reps and main depots, bosses and their offices. The links will not merely be from one town to another, but from country to country. The opportunity is here to change people's work patterns, and to let them use the telephone instead of commuting every day. Telecommunications using a microcomputer looks set to become part of our daily lives sooner or later.

Clive Williamson is the author of the Penguin book 'Getting the Most from your BBC Micro'.

System costs

PRESTEL

Residential (private) use: £6.50 per quarter
Business use: £18.00 per quarter
6p per minute computer time 8am and 6pm Mon-Fri and 8am to 1pm Sat. Connect time is free outside these hours – you just pay for the phone call.
Contact Prestel Sales 01-822 1100. For details of Educational Rates, contact Council For Educational Technology 01-636 4186

MICRONET

(includes PRESTEL subscription)
Residential (private) use: £16.50 per quarter
Business use: £28.00 per quarter
Connect time as for Prestel
Contact Customer Services Manager, Micronet 800 01-278 3143

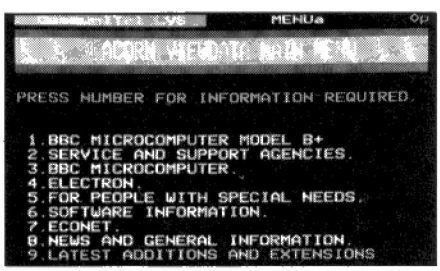
TELECOM GOLD

Corporate users (Closed user group, unlimited mailboxes): Enrolment: £300.00 then £100.00 per month minimum.
Club users (single mailbox): Enrolment: £40.00 then £10.00 per month minimum.
Connect time 10.5p per minute peak time (8am to 7pm, Mon-Fri), else 3.5p per minute.
Additional charges made for telexes, filing of data, and other services.
Contact Telecom Gold 01-403 6777

MICROLINK

Details from Microlink, Database Publications, Europa House, 68 Chester Road, Hazel Grove, Stockport SK7 5NY.

All prices exclusive of VAT.



The Acorn viewdata service.

Private Viewdata

Interest is growing in private Viewdata systems: those which offer a similar service to Prestel but are run by independent organisations such as shops, banks and even private individuals. Bulletin boards are of prime interest to the inveterate hobbyist who likes to live dangerously! It is sometimes possible to dial up systems abroad, although you often have to enrol on them first. Many bulletin boards use the 300/300 speed, like Telecom Gold, while others are just like Prestel in operation. Even Acorn Computers runs its own Viewdata service.

Micronet 800

Micronet 800 was set up in conjunction with Prestel to provide news, reviews and software for microcomputer users. The service costs £10 per quarter in addition to the usual Prestel charges. Micronet offers advice to potential subscribers on how to obtain suitable hardware and terminal software to convert a range of micros into a Prestel terminal. Here, the BBC Micro is particularly well established because it was the first machine to be linked into the system. The Micronet launch undoubtedly gave Prestel a hefty sales boost. 'The Net' has now attracted about 16,000 subscribers, and new applications are coming in at a rate of 200 a week. In addition to instant micro news, reviews and microbases on each of the main machines, Micronet 800 contains a library of computer software which can be 'downloaded' at home using suitable terminal software, and subsequently run, or saved to cassette or disk. The programs are specially encoded so that they can be sent down the telephone line page by page to be loaded into the receiving micro's memory.

Prestel extras

Some organisations use Prestel for private 'closed user groups' – the system is particularly popular with the travel industry to show flight information and booking details – and a 'Gateway' service has also been set up which allows Prestel users to 'jump through' the system into external databases held on mainframe computers in Britain and abroad. This facility is most useful for companies wanting to provide links for their employees and customers into their own data services. 'Remote banking' is possible on Prestel now that banks and building societies are starting to use Viewdata to let people keep track of their accounts from home or the office. The Nottingham Building Society has begun 'Homelink', a complete savings and banking service through Prestel, while the Midland Bank has a set-up using its own computer. Unfortunately this system is strictly experimental and already fully subscribed, but it does provide an interesting view of the future, with funds transfers, standing order enquiries and instant statements down the line.

COMPUTER CONTROL ON THE PHONE

British Telecom is a little strict about people messing about with their phones, but Peter Pindar has found a few legal tricks you can try.

The standard GPO phone doesn't seem to have a name, but everyone knows what it looks like. It's not the short-lived Trimphone, and it's not the electronic one-piece marvel from the East. It's heavy, has a real bell, and it has a dial! Its innards haven't changed much in 50 years, and there are still millions of them in Britain today. Furthermore, as people change to the electronic variety, it is likely that there will be millions of spare ones too.

It is something of a minor miracle that the basic system of telephone operation remains substantially the same today as when Bell invented it is 1875. The two-wire circuit, less the exchange switching, is shown in **Figure 1.** Dialling is achieved by breaking the loop momentarily, and the number of breaks represents the number dialled (the number zero causes 10 breaks). Most of the components inside the telephone are dedicated to making sure that speech picked up by the transmitter is not transmitted to the receiver in the same telephone. This is called sidetone suppression, and communication by telephone would be very unpleasant if it didn't work. The voltage potential on the British telephone system is 50V DC, measured at the exchange. A subscriber is likely to receive about 20V – 40V, depending on the distance from the exchange. At positive potential, the wire is called the A wire and at negative potential it is called the B wire.

DISSECTING A PHONE

British Telecom offers a specialised service and all its subscribers are bound by the rules and conditions of the network. At the premises of each subscriber there is at least one telephone outlet (the master jack unit) and at least one telephone. The master jack unit may only be linked to BT secondary jack units, and the BT telephone should not be modified in any unorthodox way. What you do with your own phone, bought new or second-hand, is of course your own business, but only Telecom-approved hardware should be connected to the exchange.

Green-circle labels signify approval and a red triangle indicates that the unit is prohibited. There is sometimes a warning stamped on foreign imports which reads: 'Prohibited from direct or indirect connection to any telecommunication system run by British Telecommunications. Action may be taken against anyone so connecting this apparatus.'

There are three good reasons why BT should be concerned about what goes onto their lines.

'The whole project depends for success on the telephone interface. On certain telephones modification is possible'

Safety: The telephone lines must not be subjected to voltages lethal to equipment or staff and neither must they be threatened by the possibility of an insulation breakdown inadvertently putting a high voltage on the line.

Capacity: BT doesn't send 50V to your house to be used as a free power pack. If an electronic telephone draws too much power from the phone lines, it will not receive approval.

Interference: Non-standard tones and pulses on the lines could cause cross-talk interference and lead to erratic equipment performance at the exchange.

In all cases, the guilty party can be traced: non-standard lines are quickly identified by blown fuses and the like!

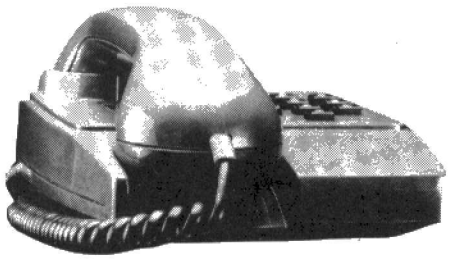
Opening a standard dial-phone presents no difficulty. The case is in two parts and a single screw (at the back) holds the top part of the case in place. Inside, the components rest on a PCB and are also screwed or riveted directly to the lower part of the case. Extension phones usually have more components and do not connect directly to the A-B line. (These are extension phones in the business sense of the word, not the second or third phone that a private individual may buy for his house.) However, the actual wiring at the phone terminals can vary: there are 19 terminals and bridging links may or may not be present.

Figure 3 should be studied carefully. The switches are shown with the dial at rest and the handset positioned on the telephone. An incoming call is an AC signal which passes through the ringing capacitor and excites the bell coils. Lifting the handset closes H1-H3 and H4-H6 and creates a more direct path between the A wire and B wire which is detected at the exchange. The bell coils are shorted and the 'connection' is completed. When ringing out, that procedure is repeated, but in addition the dial contacts, D4-D5, interrupt the connection with regular pulses which operate the exchange equipment. Whenever the dial is used, the closure of D4-D5 and D2-D1 shorts out the transmitter and receiver, ensuring a lower resistance through the telephone circuit and also suppressing the clicks that are usually heard in the earpiece while dialling is in progress.

As an exercise it is instructive to compare this circuit with the solid-state design used in an electronic phone. In the solid state design the ringing circuit is similar, except that the bell is a piezo crystal with its own 20mm diameter PCB containing a transistor oscillator. It sounds on each positive cycle of the AC ringing tone. A bridge diode network then rectifies the line current so that the main electronic board receives DC at all times.

In the case of the one-piece phone, the transition to electronic control has been

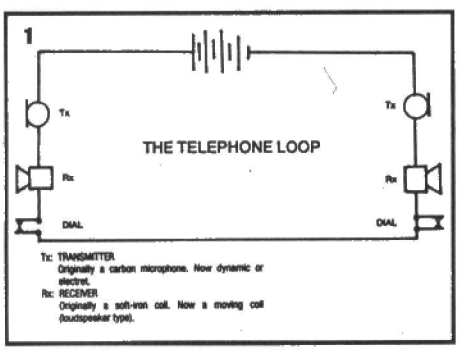
total. The larger push-button phones dating back to the pre-BT era are invariably hybrid devices. Here, the electronic part is confined to an IC and a few other components dedicated to handling the push-button dialling. A relay actually performs the loop-disconnect task, and a conventional transmitter, receiver, induction coil and bell complete the package.

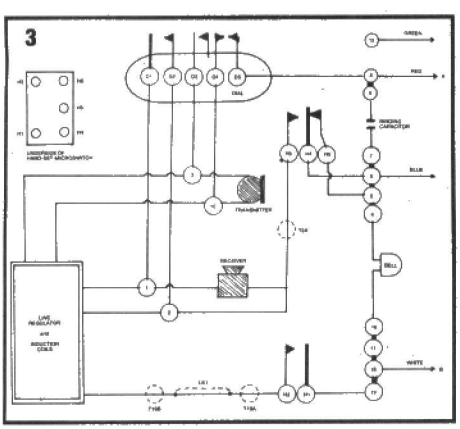


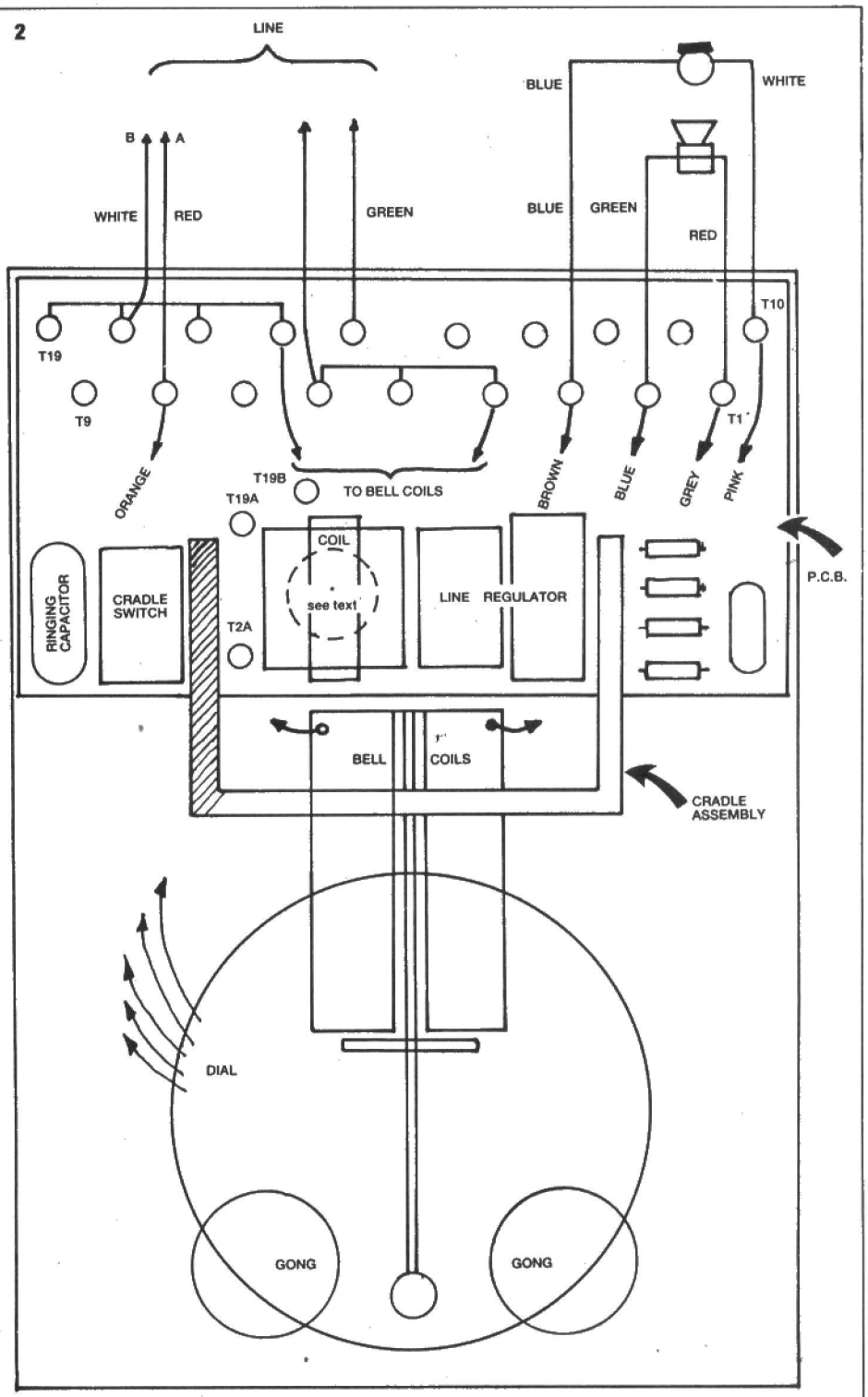
COMPUTER CONTROL

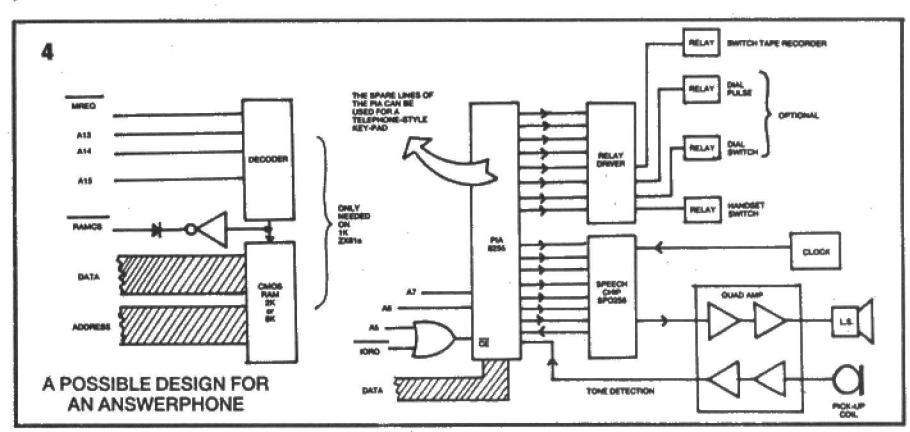
So what can you do with this information? Most computer users already own most of the ingredients of a do-it-yourself telephone answering machine and another possible option is experimentation with

1. The two-wire circuit remains substantially the same today as when Bell invented it in 1975.
2. The standard GPO telephone.
3. Telephone switches, positioned with the dial at rest and the handset on the telephone.
4. Prototype design for a ZX81 I/O and speech synthesis board for computer controlled telephone answering.









automatic computer dialling.

It should be apparent by now that the only really safe way to modify a phone for computer control is to take over control of the handset switch and (optionally) the mechanical dial. In other words, these switches are disabled and replaced with relays with low-voltage coils. This is a modification which is invisible to the exchange, with all telephone voltages, currents, tones, pulses and speech-levels remaining the same. A DPDT relay is needed to replace the handset-microswitch. Should you wish to experiment with computer dialling (which an answerphone system doesn't need) then another DPDT relay and an SPDT relay will be required to replace the dial.

LOW-COST ANSWER

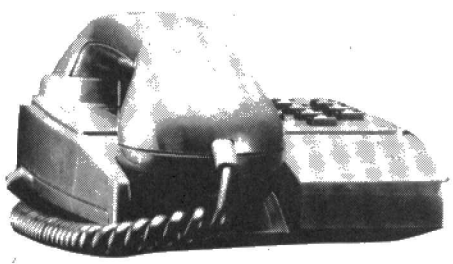
Commercial telephone answering machines are expensive and even though it is possible to find models which cost under £100, it's very much a case of getting what you pay for.

At the deluxe end of the scale there are models with solenoid-operated twin cassette decks and a host of special features.

Cheaper machines use one cassette deck, with track-switching to provide both the record and playback facility. The absence of solenoid-control means that the tape is in constant contact with the capstan wheel, and this will lead to difficulties in the tape-transport mechanism if the machine is left permanently on.

Any D-I-Y design will invariably use a standard cassette player without solenoid control and for this reason it should only be used occasionally. 24-hour use will dimple the rubber capstan and/or idle wheel and unless you like your music vibrato, it's likely to put paid to the recorder's more obvious function as a tape player.

A cheap cassette player with a remote control jack-socket or some other means of interrupting the power supply to the motor is required. In the case of battery-powered cassettes, switching the 6V battery supply would be effective, but on mains machines the only safe way to switch the motor is by means of the low voltage remote socket, if one is provided.



'The only safe way to modify a phone for computer control is to take over control of the handset switch'

Record and playback switching by remote control is not possible on all cassette models, so the machine must be set permanently to record. The message which is necessarily delivered by all well-brought up answering machines can be provided by an alternative source – speech synthesis.

The machine intelligence is provided by a ZX81, although any computer (within reason) could be used. The computer has to perform a set number of tasks:

- Detect an incoming call;
- Switch the telephone to speech (the software equivalent of lifting the handset);
- Deliver a message;
- Record the caller;
- Detect the end of the call;
- Put the telephone back onto the line (handset down).

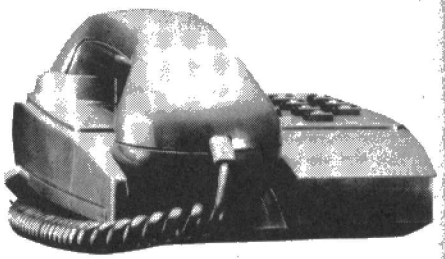
A micro has little trouble coping with the cassette recorder and the telephone handset; these are control functions which an I/O board with relays can easily handle, and the ringing tones can be decoded in much the same way as an arcade game is read from magnetic tape, but the whole project would depend for success on the telephone interface. If the standard BT telephone (which is, remember, only hired out to you) can't be modified without permanent alteration, then the only possible advice is don't try it. However, on certain models solderless modification is possible.

VITAL INGREDIENTS

You really need a surplus standard GPO phone which is in working order and not likely to be repossessed by BT. If you're lucky you might have a model with a terminal '19A' fitted, in which case the modification can be made without making any soldered connections. The important task is to trace the wiring around the handset-microswitch to see if it conforms with the pattern shown in **Figure 3.** The presence of links between terminals 5 & 6 and terminals 5 & 4 is fairly standard, but if you find that the wiring at these terminals is different then T5 can be isolated and the DPDT relay can take over: this is why a double throw relay is being used. However, normally the link-fittings effectively turn the handset switch into a single throw switch, and if this is the situation on your phone, the DPDT relay could be replaced by a DPST relay.

A relay such as the DPDT BK48C from Maplin Electronics can be paralleled onto the handset switch. One half of the relay can now be screwed onto terminals 6 and 2. In a similar manner, handset contacts H1 and H3 can be by-passed by the other half of the relay, screwed to terminals 19 and 19A. If 19A doesn't exist, a solder connection to link LK1 can be made. If LK1 is absent, which it probably will be, it should be possible to solder into the hole provided for LK1, though this will mean removing the PCB to get at its under-surface. Provided that the microswitch is always left in the 'handset down' position (a job for sellotape), the action of the relay will emulate lifting the handset.

The task of speech and tone detection must now be tackled before the telephone case is replaced. Fortunately, this is not difficult if the Maplin telephone pickup coil (LB92A) is used. These 300 ohm coils have



'Speech and tone detection isn't difficult if you use a telephone pickup coil'

a suction pad and are designed to be fitted on the outside of a domestic telephone, where, unfortunately, they are not particularly effective. However, if they are placed directly on top of the telephone induction coil using a pad of Blu-Tak, they will receive strong signals of incoming speech, outgoing speech, and all the varieties of tones which the exchange puts on the line. The pickup can also be driven by an amplifier, thus transmitting speech into the system, but it is probably cheaper to use an eight ohm or 40 ohm loudspeaker placed next to the telephone mouthpiece to transmit messages since loudspeakers are easier to drive than 300 ohm pickup coils.

Once it's established that an invisible, reversible modification to a telephone is possible, and could if need arose be created without harm to life or limb, it's time to think about a computer peripheral which will communicate with the telephone. If you already have an I/O board and a speech-synthesis board (of which there are plenty for the Spectrum and ZX81), then the theory begins to look attractive. An unexpanded ZX81 would require a system on the lines of the design in **Figure 4.** Incidentally, while it's interesting to speculate, the restrictions imposed by British Telecom are such that neither the author nor the magazine is suggesting this as a practical project.

AMSTRAD COMMSPACK

Amstrad users now have the facility to get on the phone and beam down the bytes. Nick Clare looks at the communications package that made it all possible.

The computer industry is well used to products that fail to live up to the hype that surrounds their launch, but while the description of Skywave's new 'MultiPort' interface is not short on hype, the program should be able to justify itself on technical merit.

Skywave is certainly not afraid of blowing its own trumpet. The MultiPort makes 'all other interfaces obsolete', and is the product 'that others have tried to imitate' – this last claim is difficult to justify as the interface has only just been launched. However, cutting through the over the top statements a product that should appeal to a large number of Amstrad users is revealed.

The MultiPort builds three interfaces into one enclosure, the interfaces in question being a full spec. RS232 serial port, a 24-bit parallel port and a 'sideways' ROM section which can accept two ROMs. The interface is supplied with the Skycom ROM based software package that combines the first and last of these features to enable CPC464 owners (who equip themselves with a suitable modem) to link their computers to the increasing range of remote data bases and messaging systems now available via the public 'phone system – it is this application that is likely to cause most interest in the MultiPort.

HOW IT WORKS

The design of the MultiPort is centred around two LSI devices, the 8251 that operates the serial port and the 8255 that handles the parallel interface. The 8251, in conjunction with appropriate software, supports a range of baud rates including the Prestel 1200/75 protocol and the 300/300 standard on which many bulletin boards are based. A switched mode power supply, claimed to be of a unique design, generates the + and – 12V rails that are necessary to implement a full RS232 link.

The 24 bit parallel port has three of its bits assigned to controlling the baud rate at which the serial port operates, the rest of the lines are taken to a connector that is physically compatible with the BBC computer's user port – note that the compatibility is restricted to the type of connector used and not to the assignment of connections.

Of the two sideways ROM sockets that form part of the interface, one is occupied by the Skycom ROM, the other is available for future Skywave software or indeed software written by the user.

'With MultiPort, Amstrad CPC464 users can link up to remote databases via the public phone'

The Skycom ROM is the first piece of application software to exploit the facilities offered by the MultiPort interface and, as mentioned above, will be bundled with the interface. Skycom is a window based communications package designed to provide all the facilities required to support the current range of RS232 modems. The software is written in the Forth language, in which Skywave has considerable experience. Forth is able to offer a programming environment in which advanced facilities, such as windowing, may be incorporated with little of the programming overheads that would be associated with efforts to build such features into a machine code program.

The MultiPort/Skycom combination is designed to operate with any of the currently available RS232 modems, although in order to make full use of the operating modes supported by the software the modem should be capable of multi-standard operation. Those considering the purchase of the Skywave interface who do not already own a modem are advised to contact the company, which plans to supply complete modem/interface packages.

The Skycom software operates in either 40 or 80 column mode and uses a subset of the full range of Prestel colours. The four 'colours' chosen are white, black, red and blue. In practice these give an adequate display and new users will not be aware that they are missing anything. Those who have used Prestel before will however notice that some frames take on a different appearance.

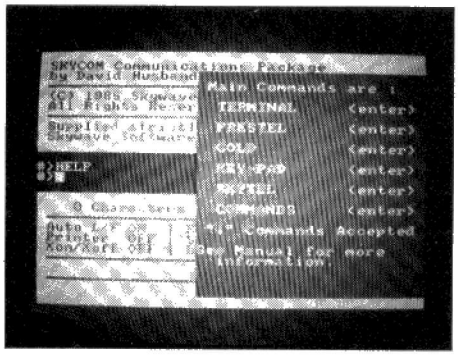
Skycom allows users to save screens of data to tape, or disk, or to spool to storage, or to a printer connected to the computer's printer port.

DOWNLOADING

A major feature of the software is its ability to download telesoftware by way of a format jointly developed by Skywave and the Viewfax 258 service. Software written to this format will form port of the material featured in a new Amstrad specific area of Prestel. Launch of this new service is targeted for October 1 by which time it is hoped to have between 2500 and 3000 available.

In addition to the Prestel service, Skywave will be operating 'Skytel', their own bulletin board for users of the MultiPort. A special ID code is built into each MultiPort unit, and this will endow users of the interface with a privileged status when on-line to the Skytel service.

The interface is designed for use with the CPC464 machine and while it can be used with the '664, this is not recommended, though a version designed for the disk based computer will be available soon.



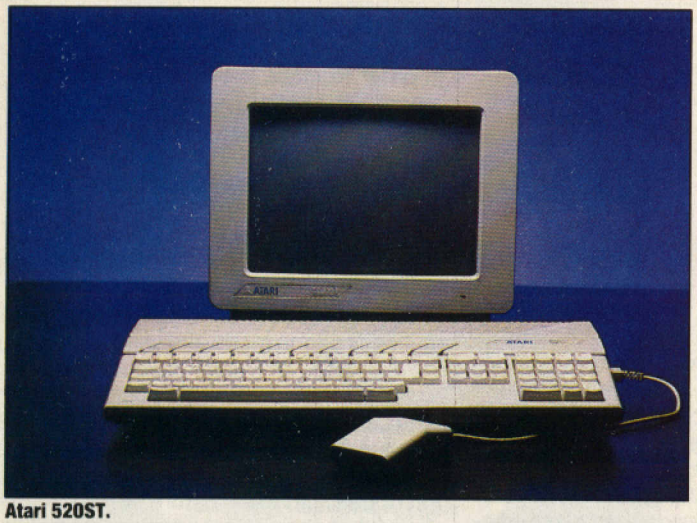
Data: Multiport

Interfaces	RS232, 24 pin parallel IDC connector. Also includes sideways ROM slots and two on board sockets.
Baud rates supported	9600/9600, 4800/4800, 2400/2400, 1200/1200, 1200/75, 75/1200, 300/300 and external
Price	£99.95
Supplier	Skywave Software, 73 Curzone Road, Boscombe, Bournemouth. Tel 0202 302385.

In brief

- The Skywave interface and software allow Amstrad users to gain access to the increasing range of telephone based data and messaging services.
- The capabilities of the computer are expanded via the parallel interface and the spare sideways ROM socket.
- The interface operates with any of the current RS232 modems, and has the ability to download telesoftware.

MORE BIT



Atari 520ST.

Sinclair QL.

Apricot F1.

Sanyo MBC550.

Five years ago home computing struggled off the ground in Britain when Sir Clive gave us the Z80. Three Sinclair machines later the QL produced an abrupt, if premature shock in anyone who thought 16-bit computers should stay in the office.

Computer users who expect more than an opportunity to dabble around in a FOR NEXT loop demand machines that can undertake a practical task, be it wordprocessing, communications, graphics or control. Today that means at least an 8-bit computer with a disk drive (say hello to the Amstrad) or better, one of the latest home/professional 16-bit machines which, their manufacturers hope, will not only satisfy existing home and low-cost business markets, but will also create an entirely new market.

British recreational and professional home computing is taking a similar path to the more mature American market where Apples and IBM PCs are de rigueur and a Commodore 64 is a sophisticated toy. It is now possible to buy a workable (workable means it has mass storage and a monitor) 16-bit computer for between £500 and £1000 – that's often an affordable proposition. It won't be an IBM PC, but a machine which performs most of the same tasks, as well or better, for half the price.

The choice, in this price range, is down to four machines: the Sanyo MBC 550/555, which was always meant to be a business computer but somebody forgot to tell the pricing department; the Atari 520ST, as yet not fully tried and tested but worthy of inclusion because of its phenomenal hardware specification and impending arrival on the streets; the Apricot F1/F1E, an educational computer, ultra low-cost business machine or up-market home computer, take your pick; and the aforementioned Sinclair QL which has suffered much from its premature birth but may yet win the struggle for survival.

There are two imponderables that computer purchasers must take into account. Firstly, is the price of the machine I intend to buy likely to drop – and should I wait? Secondly, is somebody else going to bring out a better machine – and should I wait? This is a volatile market. Sanyo has recently announced a price cut for the MBC555 and the dealer prices quoted in this article don't reflect that. A QL price drop can be expected shortly. And looming over all four machines is the Commodore Amiga. But remember that, with monitor, it will be twice the price of the Atari 520ST, it has no software as yet, and it has an unusual operating system running incompatible software.

Our reviewers have used five major criteria: technical excellence (or lack of); software and hardware support; compatibility; reliability; and value for money. Each reviewer is familiar with the machine he has tested (except of course for the Atari, with which only Atari engineers are sufficiently familiar to make a suitably thorough examination) and the results should provide potential 16-bit buyers with the means to choose the best machine for their needs.

S FOR YOUR BUCKS

Sanyo MBC550/555

The Sanyo MBC 550/555 series stands out from the other computers reviewed here because it has gone down market, not up: it looks and acts entirely like a professional personal computer, which after all it is and is fairly compatible with other PCs. It lacks only the high price tag.

The system is split into three units: keyboard, monitor, and processor unit containing either one or two disk drives. It is supplied with MS DOS, Microsoft Basic, WordStar, CalcStar, and if a 555 DataStar and ReportStar as well. The bundled software – and WordStar especially – is one of the major attractions of this machine.

WordStar was slated by the computer press. The MicroPro wordprocessor is alleged to be a major contributor to computer phobia, overcomplicated, unfriendly, unfathomable. This is patent nonsense; WordStar does have a wealth of commands but they are quite simple to use, require a minimum of keystrokes, and are illustrated by comprehensive help menus. Some of the criticisms levelled at WordStar may apply to the rest of MicroPro's software, but as wordprocessing is by far the most common application of home users these are not so important.

Microsoft Basic is aged and incomplete, but as it is the mother of most versions of Basic used on British home computers, and therefore familiar, it should not be seen as a hindrance to any but the SuperBasic highflyers.

RELIABLE HARDWARE

The MBC 550/555 hardware is workmanlike, unexciting, and therefore very reliable. The processor is a 16-bit address, 8-bit bus 8088, the same as that used in the IBM PC. There is 128K RAM upgradable to 256K, which is enough for most MS DOS software products, even with a desktop overlay. Included as standard in the main unit is a colour graphics board – a luxury on a low cost business machine but not for a competitor in the home market.

At the back of the processor unit is a Centronics parallel printer port, video and RGB outputs, and keyboard connector. Metal panels cover an expansion bus which can be used for a 10Mb hard disk, joystick port, and RS232 serial interface. The latter two are optional extras – so if you want to use a modem you will have to pay an additional £50.

The keyboard, housed like the processor unit in a sturdy yet attractive grey metal case, is a big improvement on both the QL and F1E. Unfortunately that's not saying much because most manufacturers pay scant attention to this essential item. The Sanyo keyboard is slow and squashy – the travel is too deep and spacebar requires a hefty blow from the thumb. That said, there is a gratifyingly large return key, five function keys (10 with shift) and a numeric pad with cursor keys.

THE BEST COMBINATION

The 550/555 series is available in a bewildering number of configurations, starting at around £700 for a system with one 5.25" single sided 160K disk drive with MS DOS version 1, to around £1100 for two 800K double sided drives running with MS DOS version 2.

The essential difference between the 550 and 555 series is not the number, size or type of drives but the software bundled with the machine. For the 550 this is WordStar, CalcStar, MS DOS V1 and Microsoft Basic. MBC 555 users receive the added bonus of DataStar and ReportStar, and the more useful MS DOS V2.

So which is the best combination? The four factors to consider are price (of course), compatibility, your software requirements, and drive capacity.

Avoid the more expensive 555 version if you don't envisage a need for a database or report generator. Any sensible purchaser will look for maximum compatibility when buying a computer; that means you want MS DOS V2, which will enable you to read and write to most types of file created on an IBM PC, and gives the further advantage of tree structured file directories. To reach any kind of software standard you will also need a minimum of dual double sided 360K disk drives; these are probably worth the initial outlay as it costs more to upgrade later. If you think you will require more capacity than 360K then buy the 800K drives. This isn't a standard MS DOS format but the special DS DOS supplied lets the drives configure themselves to 360K if necessary.

An MBC 550 with dual 360K drives can be bought for around £950 including a mono monitor. MS DOS V2 is not normally supplied with the 550 because it was envisaged by Sanyo as a single sided drive system, but most dealers will supply the more advanced operating system for an extra £40.

'The hardware is workmanlike, unexciting – and therefore very reliable'

Prices asked for this machine vary

Data

Processor	Intel 8088 3.6MHz
RAM	128K expandable to 256K
Mass storage	160K, 360K, or 800K 5.25" disk drives (dual or single drives depending on configuration)
Operating system	MS DOS V1 (single sided drives) MS DOS V2.11 (double sided drives)
Keyboard	Full travel, 5 function keys, numeric keypad, cursor cluster
Graphics	640 x 200 res. Colour card as standard
Interfaces	Centronics, composite video, RGB, 62-pin expansion bus (RS232 and joystick options)
Bundled software	Basic, WordStar, CalcStar (MBC550) plus DataStar, ReportStar (MBC555)
Supplier	Sanyo 0923 46363

In brief

- This machine uses old 16-bit technology which gives good hardware and software reliability but little of the speed or exciting graphics capability of the QL or Atari ST.
- MS DOS opens up an enormous range of excellent business and recreational software, and it is possible to upgrade the system to IBM PC compatibility.
- The great variety of configurations means that there should be at least one system to suit anyone who needs a low cost professional home computer.
- The lack of a standard RS232 interface will be a nuisance to users who wish to use a modem or serial printer.
- The machine is supplied with bundled software of superior quality.
- The Sanyo MBC 550/555 series is a proven and reliable system. Although, in some configurations, it is the most expensive machine of those compared here it is exceptional value for money.

enormously, so shop around and haggle where you can. We've seen a 550 with dual 360K drives, an IBM graphics board, GW Basic and a Philips monitor advertised at £1050 – the ultimate bargain basement PC. On the other hand some dealers ask up to £1150 for a dual 160K system, without the monitor. (These prices are based on lists published *before* a recent £200 price reduction by Sanyo.)

Many dealers advertise the MBC 550/555 as an IBM compatible. It isn't, unless you have the right drive combination which gives limited compatibility (we read and wrote to WordStar disks created on an Ericsson PC compatible) and have an IBM graphics board. Lotus 1-2-3 – a good test of PC compatibility – will run on the Sanyo with graphics board, and to compensate for the different keyboard layout Sanyo includes a keyboard translation table in the manual.

WILLIAM OWEN

Data

Processor	68000
RAM	512K
ROM	192K (first shipments 16K only with software on disk)
Mass storage	500K or 1Mb (unformatted) 3½" floppy disks, hard disk port
I/O	Centronics parallel, RS232 serial, composite and RGB video outputs, MIDI-in, MIDI-out, cartridge port, two joystick inputs (Later versions will include RF output)
DOS	TOS, GEM
Bundled software	Personal Basic, DR Logo, DR GEM Write, DR GEM Paint
Keyboard	94 keys including separate numeric pad, cursor control keys and 10 function keys
Price	£749
Supplier	Main Atari dealers

Atari 520ST

The Atari 520ST is a computer that can justly claim to live up to the promise of Atari's 'power without the price' slogan. Jack Tramiel, ex chief executive of Commodore, has taken the Atari corporation by the scruff of the neck in an attempt to restore the fortunes of the ailing computer giant. Extensive cost cutting and repackaging of the existing product range formed part of his efforts to move the company into profitability but the new ST range is crucial to Atari's survival.

If the initial reactions of those that have had a chance to use the computer are anything to go by, the ST series could well live up to Atari's expectations. There are however a few clouds on the horizon – the Commodore Amiga could take a share of potential ST sales.

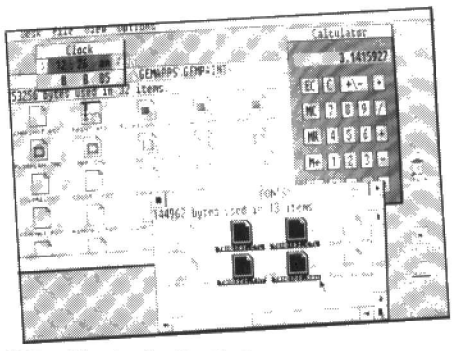
The first model of the proposed ST range to reach the UK is the 512K version (128K and 256K versions may become available at a later date). The computer's operating system will, initially, be supplied on disk, to allow the company to modify the software when early users discover the bugs that will inevitably emerge in such an extensive piece of software. The operating system goes under the name of TOS, an unfortunate choice of term but one that reflects the size of Jack Tramiel's ego – TOS is the Tramiel Operating System. In fact it is not a new OS but a thinly disguised version of CP/M 68K.

Another important part of the system software is GEM, Digital Research's Graphics Environment Manager. It is GEM that provides the ST computer with its WIMPs (Windows, Icons, Mice and Pull-down menu) environment. Adopting GEM as the ST's graphics front end means that software houses will be able to port across a wide range of existing software to the computer. Atari aims to have 80 different software packages available shortly after the official launch of the machine. The reason GEM makes the adaptation of existing packages easier than it might otherwise be is that it provides hooks to programs written in C. As much current software is written in this language and then compiled to suit the target machine, getting software running on the ST does not involve much additional work.

'Many people will need to be reassured about the reliability of both hardware and software'

The GEM WIMP environment is said to make life easier for the novice computer user. Booting up the system software presents the user with a representation of a desk top complete with icons (pictographic representations of the various facilities available). These include representations of the system disk drives, a trash can (where unwanted disk files may be dumped) and a window in which a collection of pull down menus that appears at mouse is used to move an onscreen pointer to the required icon, whereupon clicking one of the mouse's buttons twice loads the program file. During disk activity, the GEM displays a bee to indicate that it is busy (busy as a . . .).

Another part of the desk top is the collection of pull down menus that appears at the top of the screen, allowing the user to configure various aspects of the computer operation. These include the selection of printer driver and the configuration of the in-built terminal software.



GEM: a big plus for the Atari.

SOFTWARE SUPPORT

In addition to the TOS and GEM system software the ST will be supplied with the GEM Write and Paint packages as well as Personal Basic and DR Logo. At the time of review Atari/Digital Research were unable to make either GEM Write or GEM Paint available to us. Nor could they supply Personal Basic. The only package available was a not quite bug free version of DR Basic. The full suite of packages should however provide the majority of users with the basic facilities required from any computer system.

The software supplied with the ST is complemented by an impressive hardware specification. In particular the computer has a range of interfaces to cater for most needs. Both Centronics parallel and RS232 serial printer ports are provided (in conjunction with the GEM terminal software, the serial port can be used to drive a modem). The MIDI interfaces allow the ST to be used in conjunction with an increasing number of musical instruments with interfaces that conform to this standard. The hard disk port facilitates DMA operations between the computer and a low cost drive that Atari plans to launch in the near future. The cartridge slot is another bonus that will provide a means of expanding the system.

Add to all this the impressive video capability and the built in sound generator and it is difficult to fault the computer in terms of the facilities offered.

GARY EVANS

In brief

- The 520ST is sold as a bundled, ready-to-go system comprising the keyboard/CPU unit, a 349K (formatted) capacity disk drive, a mono monitor and a mouse for £749.
- The level of the machine's specification combined with the low price would seem to make the system hard to resist.
- Many people will want to be reassured about the reliability both of the hardware and the system software, as, with any new product, these are both unproven.
- Potential users will also need to be convinced that software houses will be fully committed to the ST in the years to come.

Apricot F1/F1E

Deep inside the Apricot F1E there is a good computer system trying to get out. The specification looks good -- after all, there is 256K of RAM, an Intel 8086, high-resolution colour graphics and a neat Sony 3½" disk drive, all in an exceptionally neat and elegant package.

Unfortunately much of the potential has been lost in the implementation. This is a computer which is determined to be trendy, at almost any cost to the user. When the new range of Apricots – the F1, F1E and Portable – were launched, the computer world was in a frenzy of Macalike windows, icons and mice. The golden rule was that a computer had to be easy to get on with for a completely inexperienced user.

As a result, the version of MS DOS supplied with the F1 and F1E is heavily modified. It comes with a clumsy icons/pointer user interface which can be used with either the keyboard or the optional mouse. A conventional command line interpreter is available on the graphics display, but it is difficult to do much with this. The majority of standard external MS DOS commands have been hidden away in tricky little files relating to Activity, the graphics-based front end. Instead of issuing direct commands you have to fiddle around with the pointer, clicking over icons and generally taking a long time to do anything useful.

It's okay to supply this kind of front end as an option for people who only want to use a computer once a year, but no serious user can be expected to put up with the sluggish responses and inflexibility of Activity when he could simply spend a few hours getting a working knowledge of MS DOS.

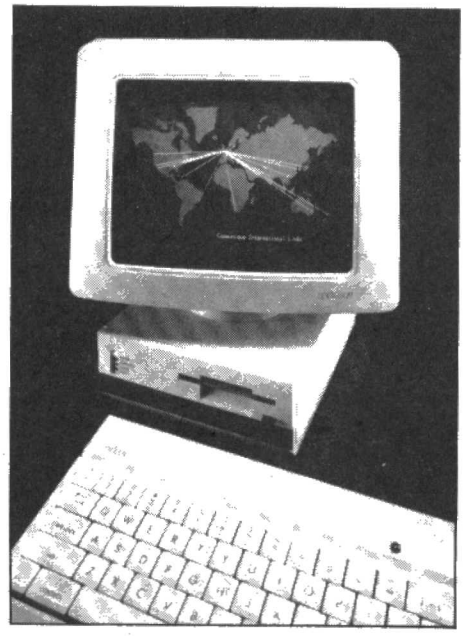
The actual hardware is not at all bad. You get a Centronics-type parallel interface and an RS232, both using sensible standard connectors, and outputs for an RGB colour monitor as well as the clearer, less expensive monochrome display. There is one internal expansion slot, which is best used to boost the RAM to its maximum 768K. You'll need this much RAM to give you enough elbow space for a ramdisk, which hots up the effective speed of the machine dramatically and lets you get around most of the limitations of the standard 315K single-sided disk drive. The more expensive F1 model has a 720K drive, which is much more cost-effective.

Other expansion possibilities include an external 10Mb hard disk and an internal autodial modem. If you run out of expansion slots (not difficult when there is only one to start with), you'll need an add-on expansion box which increases the Apricot's commendably small desk top footprint.

The keyboard is rather strange. It follows the layout of the Apricot PC keyboard, but

'An impressive specification but its potential is lost in trendy, user-friendly gimmicks'

is completely flat. The nearest equivalent is the Sinclair QL keyboard. Instead of the traditional curly telephone-type lead connecting keyboard to computer, the Apricot uses an infra-red link. This is powered by a battery within the keyboard (lifespan uncertain), and can make it difficult to communicate with the machine reliably in some circumstances. You also get an fibre optic 'light pipe', which makes a more reliable connection but does not stretch. All in all we think the old-fashioned cable was a better bet.



A number of Apricot dealers we have spoken to have their reservations about the F1 and F1E. In particular, the degree of software compatibility between these machines and the larger Apricot PC and XI seems less than ideal. Well-behaved programs such as WordStar, Supercalc and dBase II are okay, but we were unable to boot the machine from Apricot PC system disks or run the more hardware-specific programs.

Running WordStar 3.3 on the Apricot quickly showed up the inadequacy of the colour display for heavy use in 80-column mode. The characters tend to run together, inducing eyestrain. The monochrome monitor is much clearer, and costs less.

Data

Processor	Intel 8086
RAM	256K-768K
Mass storage	One 315K built-in 3½" floppy disk drive
I/O	RGB, composite video (monochrome), RS232, Centronics
Keyboard	92-key infra-red link
Bundled software	Activity WIMP front-end, parts of MS DOS 2.11. Superwriter, Supercalc and Diary on F1
Price	F1E inc. mono display, Activity, MS DOS £695 + VAT F1 inc. colour monitor, Superwriter, Supercalc, £1098 + VAT
Supplier	ACT plc 021 454 9091

RAMDISK USE

A fair range of software is available in Apricot format, though much of this comes into its own only with the use of two disk drives. The solution is to configure a 315K ramdisk as B: and transfer your program files over to that. It is unwise to use the ramdisk for data storage, because as sure as the sun rises you will one day forget to copy all the contents back to a real diskette before switching off.

Most of the heavyweight business software can be obtained for the F1, though often they are one version number behind the IBM PC equivalents. If you buy an F1 instead of the F1E you get Sorcim's Superwriter and Supercalc thrown in. These are basic, though competent. Bear in mind that the version of Supercalc in particular is rather outdated – Sorcim is now up to Supercalc 3 release 2, with Supercalc 4 due any time, and the recent enhancements have been dramatic.

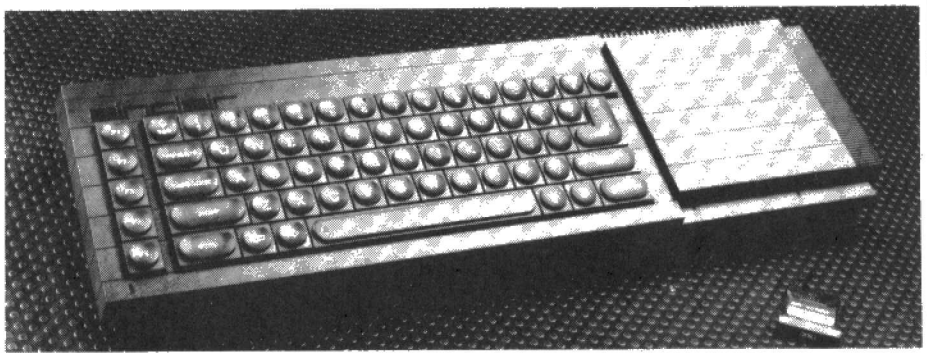
Detailed information about the insides of the F1E is hard to come by. The machine is constructed so as to discourage people from taking it apart (understandably considering how tightly everything must be packed), and the documentation supplied with the machine is a bad joke. It makes an informative sales brochure, but tells you virtually nothing you will need to know past the first two days of ownership.

SIMON CRAVEN

In brief

- The Apricot F1E has an impressive specification, but much of its potential is lost in trendy 'user-friendly' gimmicks which tend to be clumsy and waste time for serious users.
- The cordless infra-red keyboard link is an unnecessary frill that doesn't work as well as the usual cable.
- Software support is good, but software compatibility between the F1E and the larger Apricot PC and XI could be better.
- Internal expansion allows for a ramdisk, increasing the effective speed and overcoming the disadvantages of the single disk.

Sinclair QL



The QL pioneered the move – or quantum leap as Sinclair would call it – from 8-bit to 16/32-bit home computers. Its specification reflects an odd mixture of innovation and cost cutting compromise. For example, its processor is capable of manipulating a full 32-bits but can only load and store registers 8-bits at a time.

Microdrives, which afford sequential access only, have a limited storage capacity and are prone to wear and tear, represent another half way house. They may be a considerable improvement on the cassette storage that typified cheap games machines but they are nevertheless a slow and unreliable substitute for floppy disks.

On the firmware side, QDOS, the QL's operating system, and SuperBasic, its resident language, appear to be at odds with one another. The former is geared for the experienced systems programmer while the latter is designed for a first time user. What interfacing there is between the two takes place at a rudimentary level and is not particularly user friendly.

In brief

- When compared with other 16-bit micros the QL has few advantages. Its price is deceptive as to operate reliably it will require a monitor, disk drive and extra memory, all of which bring it up to the £800 mark.
- The bundled software does in part offset the added cost but even then the machine is hardly a bargain.
- Sinclair skimped on the keyboard and as a result touch typists will find it very clumsy.
- The QL's future is probably as an upmarket games machine or a cheap software development environment within schools and universities. The trends in the software would indicate that the machine is indeed progressing in this direction.
- The Amstrad CPC6128, recently announced at a price of £299 including monitor, makes the QL look absurdly overpriced and may kill it off for good.

ADVANTAGES

However, having said this, taken on their own, both are exceptional tools. QDOS at assembler level makes for easy multitasking, peripheral control and even language extensions. SuperBasic, though slow, short on debugging facilities and with a somewhat idiosyncratic and long winded command structure, is on a par with the much praised BBC Basic and a considerable improvement on the various versions of Microsoft Basic.

In terms of expansion possibilities the QL is extraordinarily well supported by a number of independent peripheral manufacturers. Monitors, RAM extensions, modems, parallel printer interfaces, floppy disks and now even Winchester hard disks are readily available. If the QL is to be used for business most of these devices are a necessity, and they add considerably to the price.

SOFTWARE

Commercial software currently available for the QL would appear to be slanted towards its use as a development or games machine instead of business. This is hardly surprising as Psion's bundled software caters for most general applications and, as it is available free, pre-empts the competition.

After a very poor start, the most recent issues of the four packages (Versions 2.03) are easy to use and perform well, even on microdrive. It should also be noted that comparable software on any other machine would be equivalent to the price of the QL itself. Plugging the gaps not covered by the bundled software are two accounting packages, Cash Trader and Sagesoft Accounts. Both are cheap and of an exceptionally high standard.

As a software development machine the QL comes into its own. Aside from a plethora of 68000 assemblers, linkers and monitors the machine supports native code compilers for Pascal, BCPL, Forth, Lisp, C and even SuperBasic. Also supported are USCD p-code interpreters (Fortran 77 & Pascal), APL, a run time module for Archive and innumerable system utilities (toolkits, editors, disk/cartridge doctors and terminal emulation software).

Data

Main processor	Motorola 68008 (8/32-bit)
ROM	32K
RAM	128K (90K user)
Mass storage	2 x 100K Microdrives
I/O	2 x RS232C serial 2 x Joystick 2 x Network RGB/Video UHF 64 way expansion port
Video	High res – 512 x 256 – Text 85 x 24 – 4 colour Low res – 356 x 256 – Text 40 x 24 – 8 colour
Keyboard Mechanism	Membrane 65 key QWERTY
Bundled software	Wordprocessing (Quill) Spreadsheet (Abacus) Database (Archive) Business Graphics (Easel)
Price	£399
Supplier	W H Smiths and leading computer stores

'The operating system and the resident language appear to be at odds with one another'

Quill, Abacus and Easel are excellent packages, in that what you see on the screen is – more or less – what will be dumped by the printer. However where GEM packages score over them is the ability to transfer data between applications. This can be done only in a limited way on the QL: with GEM it is easy.

GRAPHICS

QL games reflect problems with the machine's graphics capabilities. While its 32K memory mapped screen is capable of high resolutions the lack of any custom hardware to control it makes full screen animation a near impossibility. The trend then is to adopt fixed format and have individual sprites move across it. As a consequence the QL sports some of the best chess and tennis simulations but a very poor assortment of arcade games.

With its unique operating system the QL is not compatible with other PCs, IBM or otherwise. This means that users will not have access to a common pool of software. However, alternative 68000 operating systems such as DR's CP/M 68 adopted by Atari, OS9 and 68K OS are available to run on it (though in most cases some form of memory expansion will be needed). At present none of these have found favour with users as there is even less software running under these than there is on QDOS. On a more pragmatic note a CP/M 80 is also available.

WARREN LAKE

BBC EPROM BLOWER

Using ROMs is one way of getting over the BBC micro's acute memory shortage. You can blow your own EPROM software by building this EPROM board designed by Brian Alderwick and Peter Simpson.

The sideways ROM facility of the BBC micro is a classic solution to the 'quart in a pint pot' problem. Hardware, in the form of the sideways ROM sockets and device selection logic, plus the software built into the computer's firmware, neatly bypasses the 64K limitation on addressable memory that is usually associated with 8-bit micros.

The sideways ROM sockets are usually used to house commercial software packages such as View or Wordwise, and a disk operating system. Given appropriate hardware, BBC micro owners can also program their own devices for use in the sideways ROM area. Favourite machine code utilities, perhaps a disassembler, will then be available immediately without having to be loaded from disk, or worse, from tape.

An EPROM (erasable programmable read only memory) is an integrated circuit that can be programmed by applying certain electrical signals to it. Once programmed, the contents of the memory can be considered semi-permanent, they will be retained even when power to the computer is turned off. The data stored within the EPROM can be erased later by exposing the device to 'hard' ultra violet light through a clear window in the top of the chip. It will take about 20 minutes to erase a programmed device.

The sideways ROM, or paged ROM, area of the BBC micro is located from &8000 to &BFFF within the system memory map. The micro supports either 8K or 16K devices which should be 300nS types.

The circuit diagram of the blower **(Figure 1)** shows that the design is built around a minimum number of ICs, most of the work is done by the two large scale integrated circuits (ICs 4 and 5) and by the system software.

The programmer is attached to the micro's 1MHz bus and occupies the user applications area designated FRED by Acorn. Address decoding is carried out by ICs 1 to 3, the signals generated by these devices control the operation of the two PIAs (Peripheral Interface Adaptors) which carry out programming of the EPROM. Transistors Q1 and Q2 are used to switch the high voltage (21V) rail that is required to program information into the EPROM. The switch used to control the 21V rail also has another function. When in the 'on' position, a second pole on this switch will apply +6V to the V_{CC} pin. In the 'off' position, the programming voltage is removed from the EPROM and the voltage applied to the V_{CC} pin is switched to +5V.

'The sideways ROM facility is a classic solution to the quart in a pint pot problem'

In order for the programmer to operate correctly with Mitsubishi EPROMs a couple of other components will be required. Firstly a diode should be connected between pin 28 of the EPROM socket and pin 1 (cathode to pin 1, anode to pin 28). Another feature required by Mitsubishi EPROMs among others is control of the EPROM's output enable pin (22).

The normal method for programming an EPROM is to set the bar chip select pin (20) low, to hold the programming pin V_{pp} (1) at 21V and to apply a logic 0 pulse of 50mS duration to the PGM pin (27) after the address lines have steadied. This cycle is repeated until all addresses have been programmed. To program a device in this way will take some 14 minutes including some overhead.

Now this is very much a 'belt and braces' approach, even though the 50mS programming pulse is a worst case figure and most locations will be successfully programmed in only 10mS.

The flow chart of the intelligent pro-

'The project is supported by a constructor's pack and intelligent programming software'

gramming software, **Figure 2,** shows that a very different approach is adopted in this design. The software adopts what is termed an intelligent programming algorithm, which can cut programming time by around 80% when compared to less sophisticated designs.

Each memory location is programmed by a series of 1mS pulses. After each such pulse, the location is tested to determine whether the correct value is read back. If the correct value is obtained then a pulse of duration four times the sum of the 1mS pulses is applied and programming moves onto the next location. If the wrong value is read back, a further 1mS pulse is applied before the location is tested once again. If the correct value is not read back after 15mS, the loop is terminated and a 60mS pulse is applied before programming moves onto the next location. Typically a location will give a correct read back after just two 1mS pulses and so will receive a total of eight programming pulses. This will mean that a 27128 EPROM will be completely programmed in just 2.8 minutes as opposed to 14.

To understand the principles behind the operation of the intelligent programming software it is necessary to know something of the way in which an EPROM stores data. Each cell of an EPROM consists of a single transistor. When no charge is present on the isolated gate of this device it will produce a '1' output. When sufficient charge has been built up on the gate of a transistor, its output will be '0'. As the charge is built up there will come a point where the output changes from 1 to 0. At this point, while the cell is programmed, there is no safety margin (known as programming margin) to take account for charge loss that may occur during device life or to allow for variations in operating conditions such as fluctuations in the supply voltage. The intelligent algorithm counts the number of pulses to just program a cell – empirical observations then indicate that a further programming pulse of four times the length of 1mS pulses will give sufficient margin to ensure good performance.

Throughout this article we have referred to the project both as an EPROM programmer and, more conversationally, as an EPROM blower. Why the term blower though?

It dates back to the days when modern EPROM devices were not available. Permanent semiconductor storage was provided by devices termed PROMs (Programmable Read Only Memory). These devices, like EPROMs, could be programmed by the application of suitable DC voltages but, unlike an EPROM, could not be erased once programmed. The reason for this was that each storage element was formed by a fusable wire link. In an unprogrammed device all these links were unbroken and all locations contained a 1. To program a 0 into a location, a high voltage was applied to the device – this would vapourise, or blow, the link away.

So now you know.

A further refinement includes increasing the EPROM's supply voltage from 5 to 6V during the programming operation. This has the effect of providing an extra margin since the amount of charge necessary to program a cell to a 0 output is greater at 6V than at 5V. Thus a cell which is just programmed at 5V will have some programming margin at 5V.

Other features built into the software include automatic verify after programming, listing of the first 100 bytes of a file after loading, the option of displaying system prompts in mono. The currently selected EPROM type is also displayed at all times.

The software, which is split into two parts, is fully compatible with disk or cassette based systems. The first program is in Basic and assembles the machine code which performs the hard work of reading, writing and verifying the EPROM.

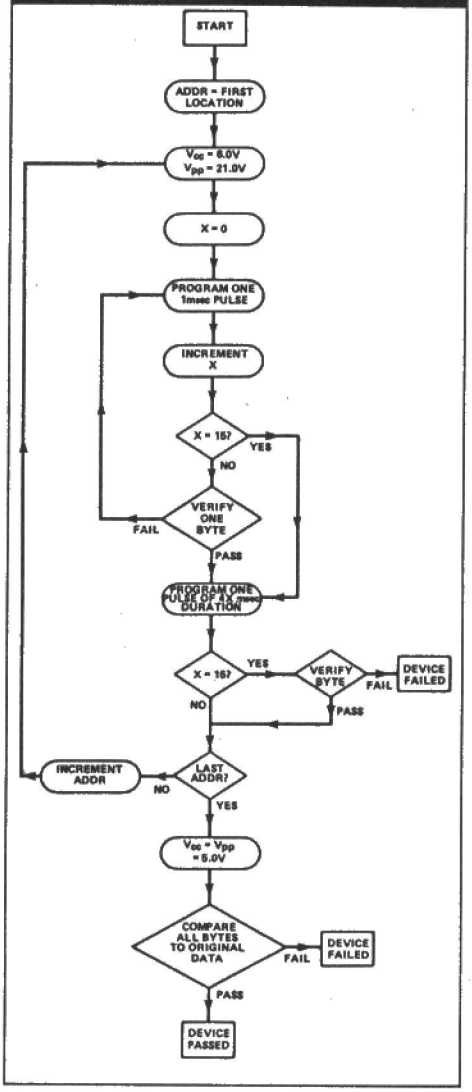
The second program, also in Basic, offers the menu options related to programming the EPROM. At times this calls up the machine code routines generated by the first program.

CONSTRUCTOR'S CHOICE

Those wishing to construct the EPROM programmer project are directed to the details of the constructors' pack given on the Reader Services page. Software for the project may be obtained from the authors at *40 The Chase, Cashe's Green, STROUD, Gloucester, GL5 4SB*. The price of the software is £7 which includes post and packing. Please state whether a 40 or 80 track disk is required.

This project is based on a design that originally appeared in the forerunner of *Computing Age, Electronics and Computing*. Those that have built the original project can upgrade this design by making some minor modifications to the hardware and purchasing the new software. Details of the hardware modifications are available from the *Computing Age* editorial offices free of charge, although we do require a stamped, self addressed envelope.

Software flowchart.



Constructive comment

The EPROM blower project is supported by a constructor's pack that contains all the hardware shown in the circuit diagram, **Figure 1.** In addition the pack contains a double sided PCB (printed circuit board) that has been designed to make construction as straightforward as possible. Even if you have not constructed an electronic project in the past, the low component count of the EPROM project and the provision of a PCB mean that it shouldn't be beyond your capability. The only skill to be mastered is that of soldering. Inexperienced constructors should use a small point soldering iron and, if necessary, practice their soldering skills on a scrap piece of board before commencing work on the project proper.

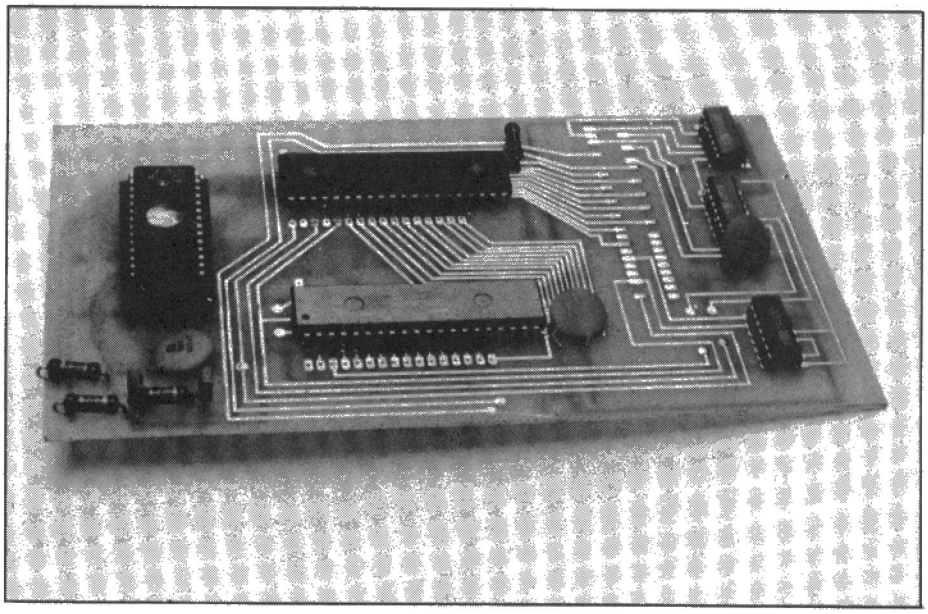
Construction commences by establishing the through board links as indicated on the overlay pattern provided with the constructor's pack. The handful of components may then be inserted checking carefully that they are the correct way round.

The final step in construction is to prepare the 34-way IDC (insulation displacement cable) that links the programmer to the BBC micro. This cable should be at least 800mm long.

The constructor is left to make a suitable power supply (capable of producing 5 and 6 volt outputs at 300mA and a 21 volt line at 60mA) and to provide housing for the project. Details of how to do this will be supplied in the constructor's pack, but these components will not be included.

The simplest way to confirm that the board is operating properly is to attempt to program an EPROM. Before doing this however it is sensible to apply power to the board to confirm that the correct DC voltages appear at the power supply pins of each IC.

Software houses often claim that EPROM blowers are used to produce pirate copies of commercial programs. Using an EPROM programmer in this way is against the law; it is also nowhere near as much fun as creating your own customised software. Few people will have the time, or the skill, to produce 16K machine code epics, but creating a collection of useful machine code utilities will be within many people's capabilities.



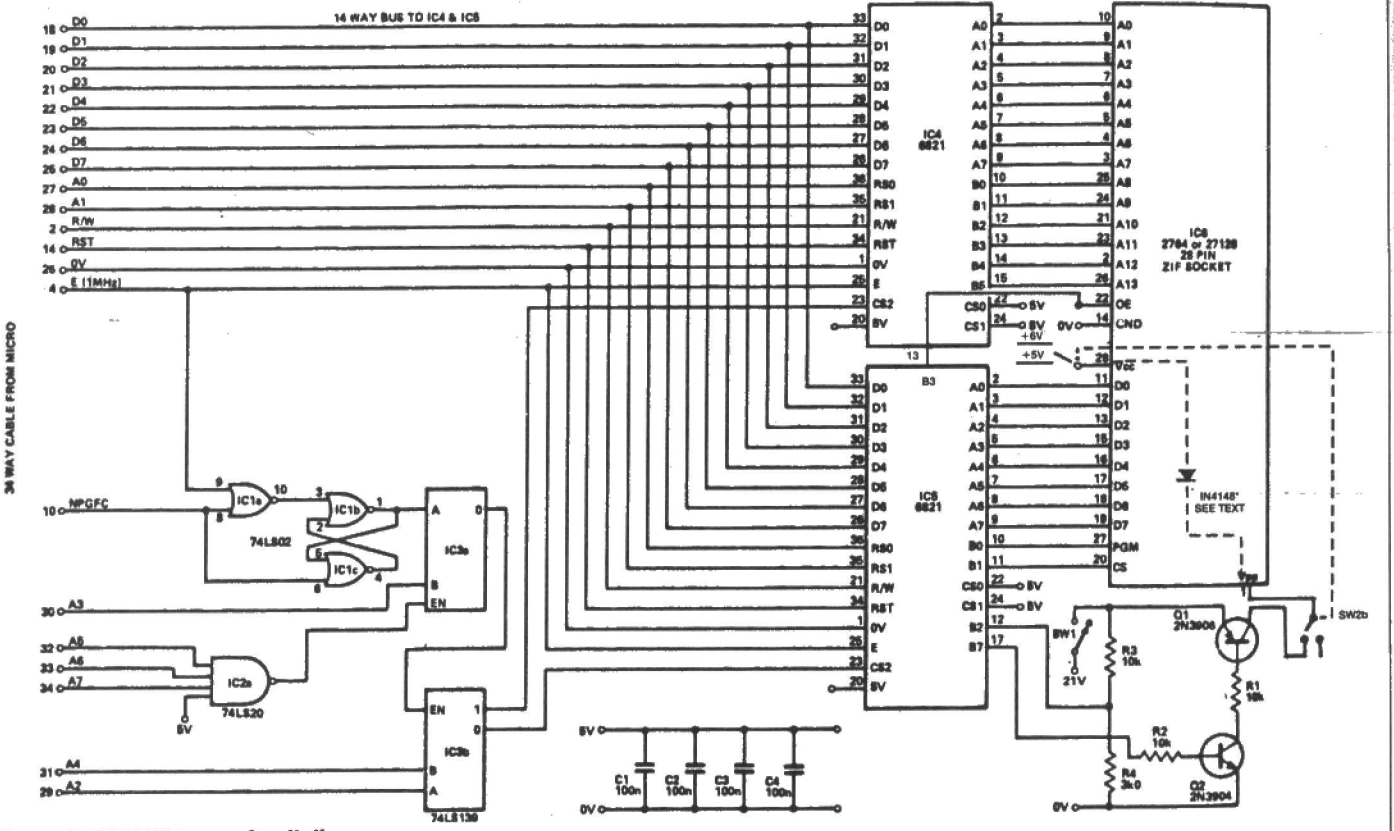


Figure 1. EPROM blower circuit diagram.

C IS FOR CONTROVERSY

The unique portability of C will soon make it the most important programming language. Adam Denning describes its development and looks at implementations of C on low-cost computers.

'Flavour of the month'; 'This year's model'; 'Unintelligible'; 'Compact, powerful and elegant'; 'Horrible'. All these phrases have been applied to the C language recently, but whatever people say it is destined to become the most important programming language.

It is already very nearly in that position, with only a very few companies sticking to older languages like PL/1 or Pascal. Digital Research, for example, took the major step of re-writing all its language products in C, and its GEM front end is not only written in C but is especially easy to interface with other C programs.

C began a long time ago, in Cambridge. That university, together with London, was developing the all-encompassing language to be known as 'CPL' (Combined Programming Language). Unfortunately, the project was so large, and inter-university rivalries so great, that the project was shelved prior to completion.

One of the workers, Dr Martin Richards, kept faith in the project and eventually came out with a new and vastly simpler language called BCPL (Basic Combined Programming Language). This had most of the good points of its forebear and very few of the bad bits.

BCPL has the advantage of having a very small and easily portable (from machine to machine, operating system to operating system) compiler, and of being more structured than the average programming language. It is, however, very much a 'love it or loathe it' language, as it has no data 'types'. A data type is the way in which a particular piece of data is interpreted – as a floating point number, an integer, a string and so on. All data in a BCPL program consists of 'words' which may be interpreted in any way the programmer desires. This has great advantages but it is not liked by everybody.

The language made it across the Atlantic, where AT&T's Bell Laboratories at New Jersey were writing the Unix operating system. These people played around with BCPL a bit and came up with B. This didn't last too long, and Dennis Ritchie set about re-writing it yet again, giving birth to C. He and Ken Thompson used their new wonder language to re-write Unix, making it a lot more portable and a lot easier to adapt and extend.

C is very similar in many respects to BCPL, sharing the general layout and structure, but also having types, including complex aggregates similar to an Algol/Pascal RECORD, and lots of other bits such as compound operators and a powerful 'pre-processor'.

After a considerable time in which C was used extensively, at Bell Labs and other installations, Dennis Ritchie and Brian Kernighan wrote a book about the language in order to set a standard and gain the language more popularity. Since Unix grew up at the same time, and was almost universally hailed as the hottest property since Rocky Marciano's fists, C soon became the de facto standard in modern computer installations.

C offers the programmer the power of assembly language, the conciseness of BCPL and the structured aspects of BCPL/Algol/Pascal style languages. Almost perfect! It gets over the typing argument by implementing what is known as 'weak typing', which means that although types formally exist it normally doesn't mean too much. It is possible, for example, to add a character to an unsigned integer and store a variable through the result. Again, the responsibility is on programmers to ensure that their data means what they think it does, but at the same time the flexibility of floating point numbers, structures, unions and integers (among others) allows for more compact algorithms than BCPL could manage under similar circumstances.

Considering the other languages around, why would a programmer or software house choose to use C rather than another language? Well, they may not, as there are always instances where one tool is better than another. A good programmer would need to be well versed in assembler, C and Pascal to get the best job available.

Comparing C and assembler, C can do just about as much as any assembly language but can do it in less source space with far less development time. The end product, being compiled, is unlikely to run much slower.

Compared to Basic, C has more advantages than in most other comparisons. Unlike Basic, C is near enough standard

LISTING 1

```
chkvars(p,num)
struct term *p;
int num;
{
 int varnum;
 struct term *q;
 q=p;
 varnum=0;
 if (p->op_t==VARBL && (p+1)->op_t==OPERT)
  if (p+1-q < num && (p+1)->elem=S_ASS)
  {
   varnum=(int)p->elem;
   p+=2;
  }
 while (p-q < num)
 {
  if (p->op_t==VARBL)
  {
    p->op_t=CONST;
    p->elem=vartab[(int)p->elem - 1];
  }
  ++p;
 }
 return varnum;
}
```

between different implementations. It is also structured. allowing it to be function and module based, which you can't do with Basic, and it allows the programmer to be far more flexible in his choice of algorithm implementations because there is very rarely something which cannot be done in C!

Pascal is probably the major competitor, due mainly to the continued belief in this language at schools and universities. It isn't helped by the fact that Ada, the American Department of Defense recommended language, is gaining popularity. I have yet to meet a professional programmer who actually relishes the prospect of programming in Ada.

Pascal offers much the same structured approach as C, but does it far more formally. This means that it is strongly typed, so you cannot assign an integer to a character without a lot of hassle, and it must be laid out in a particular way. Pascal programmers also tend to put far more comments in their code than C programmers, so the average Pascal program is far easier to read and maintain than an equivalent C program. This aspect isn't helped by C's initially devious syntax, as you should see from **Listing 1.**

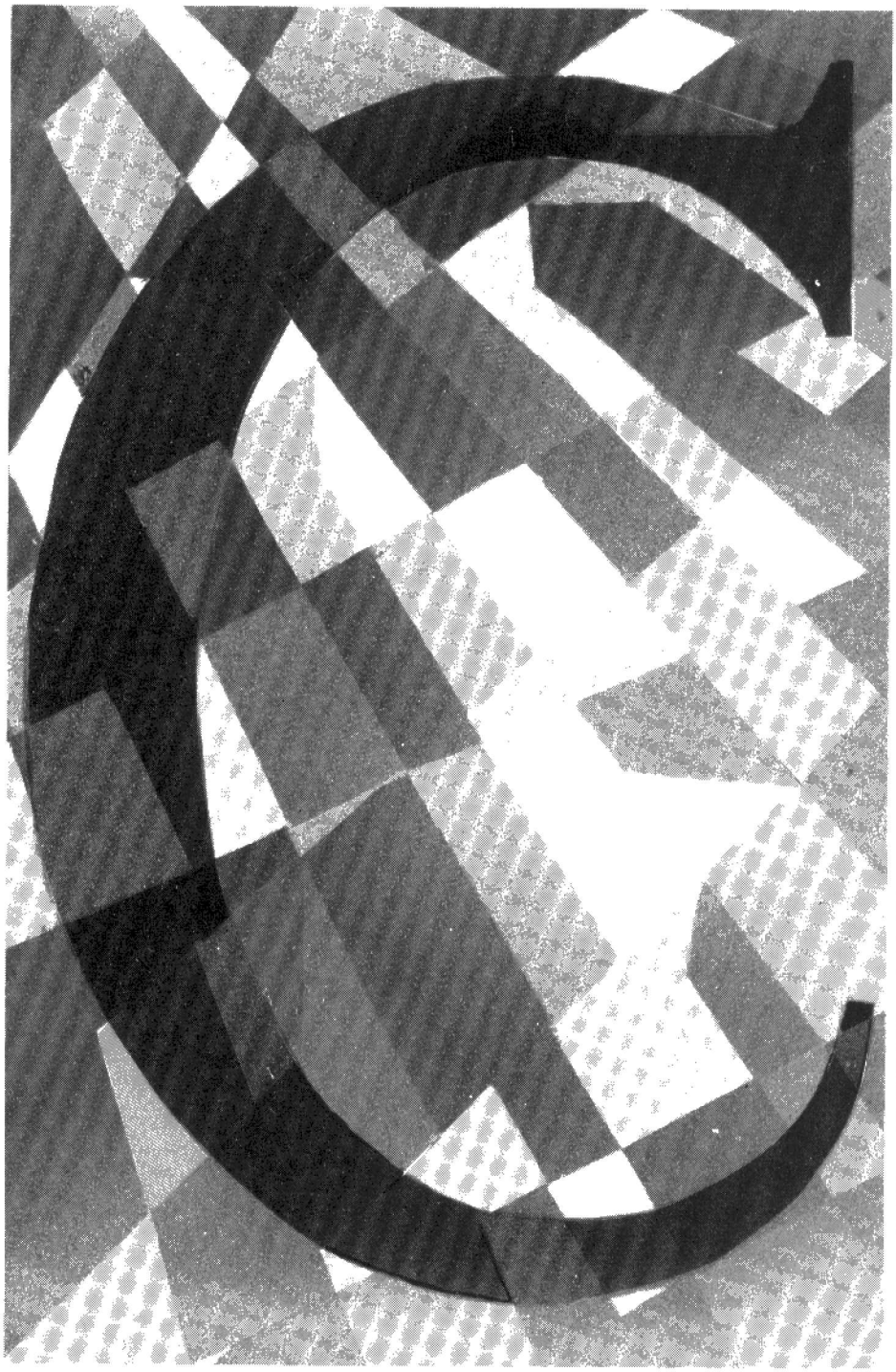
'Hisoft's C compiler for the Amstrad is wonderful value for money'

It must be said, that a typical C function, such as the one above, is packing far more power into a much smaller space than a Pascal function with the same aim could. That doesn't make it any more readable, though, and highlights the first principle of C programming: Know the syntax and the semantics of the language inside out!

The second principle is that you must understand what a pointer is, as they are so fundamental to C programs that if you ignore them you lose nearly all the benefits of choosing to program in C in the first place. This isn't a C tutorial, so we won't go into the details, but essentially a pointer is an item that points to another item. It is not uncommon to see pointers to pointers, and pointers to function which return pointers to functions, and so on ad infinitum.

Another good reason for choosing to program in C is that the source code is portable across numerous machines. Okay, this is said about almost all languages in existence, but C is one of the few to actually prove to be so in practice. If we go back to the example of Digital Research's GEM, notice that this is running on an 8088 machine (the IBM PC with PC-DOS) and a 68000 machine (the Atari ST with TOS). That's two entirely different processors and two fairly different operating systems. It's also portability.

But . . . the average *Computing Age* reader is unlikely to have an IBM PC, so what sorts of C compilers can he buy to satisfy his programming requirements?



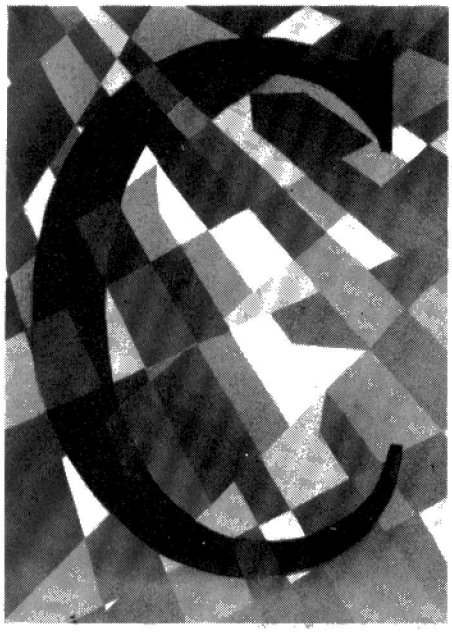
Until recently, not a lot, but with the advent of a C compiler for the Spectrum last year, things have really hotted up on the small-machine C compiler fronts. Let's take each popular machine in turn.

SINCLAIR QL

At present, this machine has one compiler only: that from GST. This is a 'small C', which means it doesn't incorporate the more useful features of C such as structures, floating point numbers and unions. It is not really suitable for learning C with, as it differs from the standard in many respects, but it is a useful tool for building smallish programs relatively quickly. It costs £59.95 and includes an assembler, a linker and a runtime library, so it's not bad value for money.

Currently under beta-test is the Metacomco Lattice C compiler, a derivative of the immensely popular Lattice compiler found on much larger machines. Early

'The Lattice C compiler for MS DOS (etc) costs about £500 but seems worth every penny'



impressions suggest that this product is very good indeed, but costs considerably more than the GST C. Nevertheless, it has to be the recommended compiler due to its standardisation, renown and facilities. There are rumours of another couple of C compilers from Computer One and Prospero, but these have yet to be substantiated.

AMSTRAD CPC464/664

The compiler for these machines has only just been released, but it has already proved immensely popular. This is the Hisoft C compiler, which offers a great deal of Unix compatibility, and also comes with an extensive library providing functions for accessing all the features unique to the Amstrad. It costs £34.95 (or £39.95 for the disk version), so it is wonderful value for money. Currently, it creates programs to run on a normal Amstrad rather than CP/M, but a true CP/M version with overlays is promised for release in the very near future. This will make it one of the cheapest compilers available for CP/M.

'A typical C function packs more power into a smaller space'

Other CP/M compilers which have gained popularity over the years are BDS C and Whitesmiths, although neither seems to be available for the Amstrad. They cost in the region of £150. As far as I know, none of these compilers is able to support floating point numbers, although again this is promised in a future release of the Hisoft product.

MS DOS AND CP/M-86

Now things get difficult. Looking through an average copy of *Byte* magazine, I found no less than 14 C compilers advertised for MS DOS (etc) machines, and there are certainly more than that about. I use Digital Research C, as it is relatively cheap (£300!), very much Unix compatible and one of the fastest to compile and execute.

The only other compiler I have had experience of on these machines is the Lattice C, which costs in the region of £500 but seems worth every penny. It has the virtue of being liked by almost everyone, so there is a huge library of functions which may be added to Lattice compilers to implement just about anything you can think of. If you need an 8086/8088 compiler, I'd recommend one of these two.

THE BBC MICRO

Stop me laughing. This machine, even the much-unvaunted '+' model, is wholly incapable of supporting a C compiler. It's distinct lack of memory and out-dated 6502 processor mean that to implement a C compiler worth its salt would be a feat of memory management. This shows the machine's age, and really helps to show it up as very much yesterday's computer.

A MACHINE FOR LIVING

Can you control your life and all the electronic gadgets that make it so comfortable from a prone position? Gary Evans thinks you can.

The computer industry is continually telling us how computers are adding to the quality of life. When pressed to explain just how this improvement in living standards as a direct result of new technology manifests itself, computer people are often rather short of convincing specific examples.

Increased productivity as a result of adopting microchip based machinery and control systems has, most will concede, added to the wealth of this country and has thus contributed to the quality of life. Advances in chip technology have given us such luxuries as the video recorder, the remote controlled TV set, the micro wave and the automatic washing machine – all items of equipment that make the daily grind a more acceptable proposition.

'All houses already have a network that could be used to carry computer data – the existing mains wiring'

These examples though seem to avoid the direct question posed above – surely there must be a clearcut case where the micro computer can directly lead to an improvement in the lot of the proverbial 'man in the street'.

Such an application would make life more convenient, would possibly lead to some economic benefits for the individual, would make life more secure in an increasingly dangerous world. Just such an application is the concept of the computer managed house. The use of the word concept indicates that, while much of the technology necessary to implement such a home control environment is available today, it has still to be applied in all but a few homes.

To use a computer in the home environment seems a logical step. A typical home consists of a number of interconnected boxes, rooms to you and I, in which the householder places a number of items of electrical equipment – lights, TVs, cooker, hi-fi, etc – and a variety of sensors, from the humble light switch to more sophisticated devices such as central heating thermostats. In a typical home all these individual items operate independently of each other – if ever there was a case of the right hand not knowing what the left was doing, this is it.

A computer equipped with the appropriate interfaces and controlling software would be able to co-ordinate the operation of appliances throughout the home.

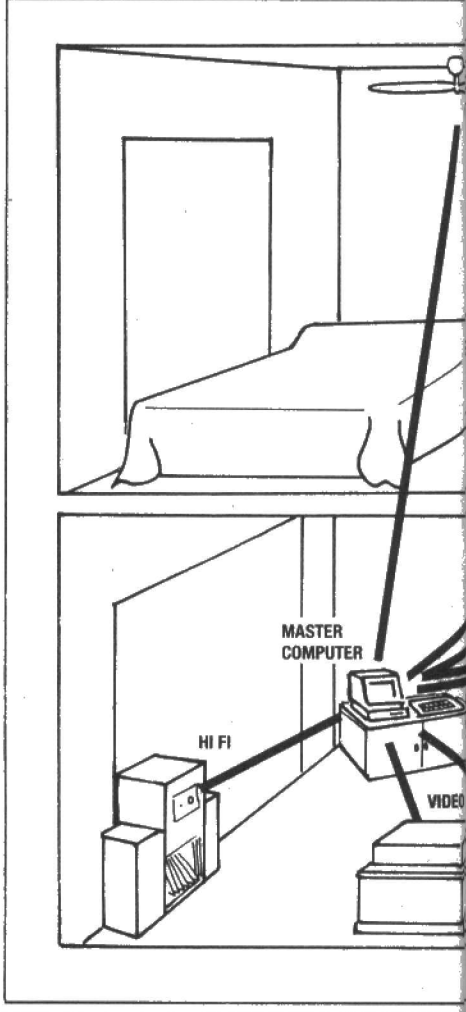
WIRING

Given a central computer and a variety of electrical equipment scattered throughout a home, the first problem to tackle is the way in which the computer will convey its instructions to the item it wishes to control. To run a bird's nest of wires from the computer to each item of electrical equipment would not be an acceptable solution in most cases. While houses of the future will in all probability have such a computer data network built into them, just as many modern offices have, this is no help in the case of existing dwellings. Fortunately all houses, no matter how old, already have a network of wiring that can conveniently be used to carry computer data around the home in the form of the existing mains wiring.

While the ring main is designed to carry high current, 240V AC mains voltages, it can also reliably be used to carry serial computer data signals. This is achieved by superimposing the computer signal onto the mains voltage as a high frequency, low voltage signal. A transmitter at the computer puts data onto the ring main while special receivers at power points throughout the home separate out the data signal from the mains voltage.

One problem is that the computer must be able to 'talk' to each remote unit on an individual basis. If the computer wants to turn on the light in the lounge, it must be able to do so without switching on the washing machine at the same time. In order to achieve this degree of control, each remote unit is given a unique 'name' in the form of a binary code. The computer, by sending this code over the network before any control command, can ensure that only the appropriate unit will respond to the instruction that follows.

A typical commercial system using this 'bytes by the mains' technique is marketed under the 'System X-10' label. The central control unit of this system is a dedicated processor which is designed to be programmed via the RS232 port of one of a range of popular computers. Software supplied with the system makes heavy use of computer graphics in order to make the set up as simple as possible. When in 'install' mode, the user sets up a seven day clock before going on to provide the computer with a map of the home. This is achieved by placing icons, pictographic representations of the appliances to be



of the home. The system supports eight different icons in seven rooms, enough for the average home, giving a total of 56 different control locations.

Having provided the computer with a model of the environment that it is to control, the user then moves into the 'operate' mode. In this mode, the user selects one of the rooms, then the appropriate icon, which may then be instructed to turn on or off immediately or at a specified time during the current day, on any specific day or indeed every day. In the case of controlling a lamp, the brightness level of the lamp may be set to one of two levels.

Having programmed the control unit, the unit is disconnected from the micro used to install the program which may then be freed for other purposes around the home.

System X-10 switching units are designed to meet a range of applications. The simplest of the units plugs into a power socket, the appliance to be controlled is then in turn plugged into the control unit. A range of such models is available to cater for a range of power ratings; lamp control units differ from general purpose ones in that they make provision for the lamp to be set at various brightness levels.

Other units are designed to replace existing power outlets and light switches.

The benefits gained by installing a basic system are twofold. The first is general convenience: all the lights in a house may be controlled from a central location, beside your favourite armchair for example – no need to fumble for the hall light switch any more. The second advantage is that it should make the home less attractive to burglars in that lights and even the hi-fi may be instructed to switch on and off when the house is unoccupied.

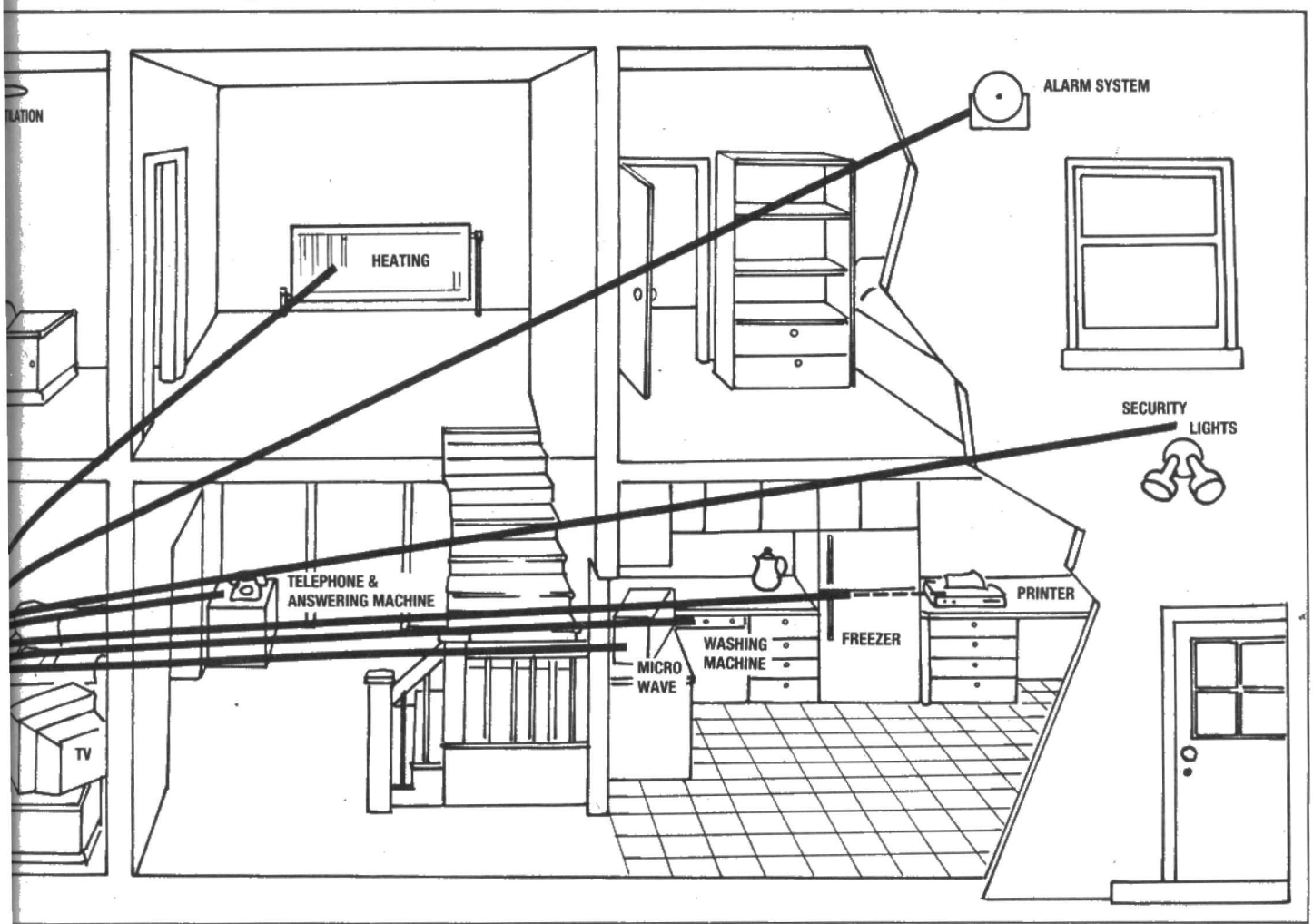
Other units of the X-10 system allow the heating of a home to come under control of the computer. An ingenious system of interfacing to an existing heating system has been adopted by the designers of the system and means that there is no need for an electrical connection between the computer and heating units. The heating controller consists of a thermostat that feeds back temperature information to the computer and a small heating unit and fan. The idea is that the unit is placed near to an existing thermostat in such a way that the heating unit blows air over the original temperature sensor. If the computer decides that a room has reached the correct temperature it can blow warm air over the heating system's themostat and so fool it into thinking that the room is warmer than it really is.

REMOTE CONTROL

Another major benefit of computer control is that it is possible to exercise control from a remote location by making use of the telephone system. A telephone responder/control unit can be connected to the control computer. This will automatically respond to an incoming 'phone call. When the system has answered it is possible to alter any of the system's settings by way of a handheld control unit that sends signalling frequencies down the line.

System X-10 is an example of what is available now. The Chicago CES saw one manufacturer show what will be possible in the near future. The Hitachi computer controlled exhibit presupposed that such a home of the future would provide a computer data network that would be wired at the same time as the ring main was laid. Light switches would all be replaced by numeric keypads which could control the central computer from any location in the house.

Given the concept of computer control, the possibilities are, as they say, endless. For example, most convenience food will soon have a bar code indicating its identity, and it will be a simple job to pass each item of food over a light pen before placing it in the freezer. The computer will then be able to tell the owner if any of the stored food is in danger of going past its recommended 'eat by' date. The system would also be able to come up with suggestions for well balanced meals based on the contents of the freezer!



OVERCOMING INCOMPATIBILITY

Exchanging data between foreign file formats is a tricky, but, says Mike James, not insoluble problem.

The idea of a DOS is simple enough but in practice there are many different ways of organising sectors into named files and this gives rise to problems of compatibility. Even with identical hardware there is no guarantee that disks can be exchanged successfully if two different operating systems are in use.

There is more than one disk drive standard, which often means that a disk produced by one system is incompatible with the drives in another. In other words, there is no chance of reading any information stored on the diskette, not because of any difference in the organisation of sectors into named files, but because the hardware cannot read even one of the sectors. So before going to any trouble to discover if it is possible to read named files from a foreign disk, it is important to establish physical compatibility.

The following list will give you some idea of the different specifications found on current drives and the sorts of problems that they can cause. The list is by no means complete and you can always expect to encounter something unexpected when examining a disk written by an unfamiliar machine.

TRACKING

The number of tracks written on a disk is an obvious source of compatibility problems, but it's important to distinguish between two different types of tracking problem – the total number of tracks and the track density. Early disk drives wrote a total of 35 tracks on a 5.25" diskette, then with the improvement of drive heads this was extended to 40 tracks but using the same track density of 48 tracks per inch (TPI). This meant that a 35 track disk drive could read the first 35 tracks on a 40 track disk and a 40 track drive could read all 35 tracks on a 35 track drive.

The situation with double tracking drives is different. In changing from 40 to 80 tracks the track density had to be doubled to 96 TPI and this makes it quite impossible for a 40 track drive to read an 80 track disk. The recording head cannot be positioned that accurately.

'As long as the drive can read sectors from a disk, all you need is a software patch'

You can make an 80 track drive read a 40 track disk by double stepping the head; that is moving it by two 96 TPI track widths for each step, but results are variable because of alignment problems. It is also possible to make an 80 track disk drive write a 40 track disk at 48 TPI by the same technique but in many cases the resulting disk can't be read by a true 48 TPI drive because the head can't cope with the half-width tracks.

There are two distinct ways of dividing a track up into sectors – hard sectoring and soft sectoring. Hard sector drives can't usually be made to read soft sectored disks and vice versa. This incompatibility is due to the disk controller rather than the drive itself and in principle it is possible to modify the controller to read any type of sectoring. However, unless you are prepared to commit yourself to a degree of hardware and software development it is better to consider hard and soft sector disks as incompatible.

Soft sectored disks are the more common and the main difference between them is the sector size. Originally 128 byte sectors were standard but now 256 or 512 byte sectors crop up as often. Soft sectoring is looked after by the disk controller and most will read and write sectors of any size, so in principle there is no incompatibility between disks that use different sector sizes.

SIDES AND DENSITY

Disk drives are either single or double sided according to the number of heads used. A double sided drive can usually be made to ignore one of its heads and so read or write a single sided disk.

Disk drives can also be single or double density and this too is controlled by the type of head fitted. A double density head has a narrower gap and so it is capable of reading and writing more data to the inch. Obviously a double density drive should be capable of reading and writing a single density disk but whether or not it can in practice depends on factors such as the disk controller and the system software. Most disk controllers can work in either single or double density mode but it's not uncommon for manufacturers to provide software that will work only in double density mode.

'A double sided drive can usually be made to ignore one of its heads'

Although the majority of disk variations can be accounted for in terms of maximum number of tracks, track density, sectoring, number of sides and density there are always examples that are completely different. For example the Sirius and now the IBM PC AT incorporate a drive that alters the speed of revolution according to which track the head is positioned over – revolving faster for the inner tracks. The

The DOS

The hardware of even the most sophisticated disk drive is primitive when you consider the job it has to do within a complete computer system. The drive hardware provides the facility to read and write blocks of data; each block is referred to by a numeric address that is composed of a track and sector number. However the typical computer user doesn't want to save and load data in terms of track and sector numbers but as named files. It's possible to build disk hardware that works in terms of named files, but much easier and cheaper to write software that will organise the sectors into named files – such a piece of software is called a *disk operating system* or DOS.

Apple disk drive used its own method of coding data and Commodore drives have always been a law unto themselves.

SOFTWARE COMPATIBLE

As long as the drive and its associated electronics can be made to read sectors from a disk the problem of reading a named file is entirely one for software. If you have a software patch that will read a given sector from a foreign disk (ie it overcomes the hardware difficulties) the problem of reading a given file then comes down to finding out how many and which sectors have been used to store the data that makes up each file. This implies a knowledge of how the DOS (that was used to create the disk) organises sectors into named files. This information can be hard to come by, so the rest of this article describes how a popular operating system, CP/M, creates its files.

The information that defines each file present on a disk has to be stored somewhere. The usual place is a special area of the disk known as a directory. Directories vary in their complexity according to the DOS in use. At the very least a directory has to contain the name of each file on the disk and information on the location of the first sector of each file. The type of directory that a DOS uses can be crucial. Advanced operating systems such as MS DOS V2 and OS9 have given the simple directory idea a new sophistication, but it is still true that somewhere on each disk is a special area set aside to store information about where the useful data resides.

CP/M reserves the first few tracks (usually 2 or 3) of every diskette as system tracks where it stores a bootstrap loader and a copy of itself all ready to get a machine running. It also uses 16 sectors for a directory. Each directory entry uses 32 bytes so a standard CP/M directory can hold enough information for 64 files. Each directory entry has the format shown in **Table 1.**

The user number and the filenames identify the file in question; bytes 13 to 31 are used to record the information on where the file is stored. In principle the 16 block numbers (bytes 17 to 31) correspond to the list of sectors that make up the file but to overcome the problem of having to store long lists of sectors storage is dealt with in groups of sectors called a block. A block can be thought of as a sort of super sector because, while the disk hardware still works in terms of sectors, the smallest amount of storage that can be assigned to a file is a block. Typical systems use blocks of eight 128 byte sectors for a single sided disk, but blocks of 16 or 32 sectors are not uncommon and the variation in the size of a block is one of the many causes of incompatibility between CP/M systems.

Blocks are numbered in sequence starting with the first sector after the system tracks. Thus the directory takes up the first two blocks (one and two) but the rest are available for use by data files. As a file is created free blocks are acquired and their numbers are recorded in the directory entry.

If a file doesn't use a whole number of blocks then the end of the file is indicated by the number of records counted in byte 15 of the directory entry. For example, the following directory entry shown in **Table 2** defines a file called MYFILE.TXT (belonging to user zero) composed of blocks 38 and 48. As the file is only 15 records long (in CP/M jargon a record is a 128 byte sector) and there are 8 records per block, the final sector in block 48 is unused. Even if parts of blocks are unused they cannot be assigned to another file – they are wasted space. Reading the file MYFILE is simply a matter of reading the directory sectors until its directory entry is found and then reading each sector in each block in turn.

As this method stands there is one important shortcoming: the maximum file size is 16 blocks (or 16 x 8 x 128 bytes which is 16K). To allow larger files CP/M used the notion of *file extents*. Each directory entry can control 16K of storage, so to create a file larger than 16K, all you have to do is use additional directory entries, each one controlling a 16K extent.

The extent number in byte 12 of the directory entry is used to indicate which file extent the entry controls. When a catalogue of all files on a disk is constructed only directory entries corresponding to a file's first extent are listed – the remainder are hidden. Think about this for a moment. You'll see that while there is a theoretical maximum of 64 files on a CP/M disk, this assumes that all of the files are 16K or less, that is, they each use just one extent. It is possible to run out of directory space before the 64 file mark by having files that use more than one directory entry to store.

There are many more fine details about the way that the CP/M file systems works, but this outline covers the important points and will enable experienced users to write a program that will read a CP/M file. The only additional piece of information that might prove useful is this: CP/M marks unused or redundant directory entries by setting the first character of the filename to $E5. So, even after a file has been deleted, its directory entry remains intact (apart from the first character of its filename) until the directory entry is reused to create another file.

TABLE 1. CP/M directory format

BYTE	0	1-11	12	13 14 15	16-31
Filename	User Extent Number	?? ??	Number	Block of records	numbers

TABLE 2. Sample directory entry

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18 - 31
M	Y	F	I	L	E			T	X	T				15	26	30	00 - 00

A universal OS

It is possible to imagine a computer system with disk drives and controller hardware carefully selected to make it physically compatible with most of the disk formats in current use. However the prospect of having to write software to read and write all the different disk formats produced by the current operating systems is frightening. CP/M on its own is capable of creating an almost infinite range of slightly different disk organisations. Add to this the thought that UNIX, MS DOS V1, MS DOS V2, OS9, Pick, UCSD, Flex, etc all introduce totally different disk organisations and you will see why such a universal disk system will be an expensive proposition. Perhaps it would be better if we could agree on a single standard for disk exchange that was independent of any operating system?

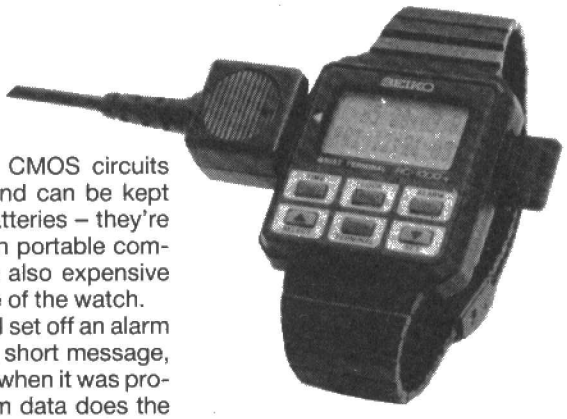
'Variation in the size of block is one of the main causes of incompatibility between CP/M systems'

OS9 is a sophisticated operating system now available for 6809 and 68000 systems. OS9's filing system is interesting because it tries to incorporate features of the simple block storage scheme with the more sophisticated table storage scheme.

OS9 also groups sectors together to form allocation units but in OS9 jargon they are called clusters. Typical cluster sizes are 1, 2 or 4 sectors per cluster. An OS9 directory (and there can be more than one on any given disk) is remarkably simple, and comprises of a number of 32 byte directory entries. Each directory entry is simply a 29 character file name followed by a three byte logical sector number (LSN). An LSN is simply another way of referring to a given sector. Instead of using a track and sector address each sector is numbered sequentially starting from track zero sector one to the final track and sector. Of course before a sector can be read the LSN has to be converted to a track and sector address but this isn't difficult.

The LSN that is stored along with a file name is the LSN of the first sector in the file. To find the remaining sectors of a file you have to look in the first sector itself, which forms a sort of extension to the directory.

SIGN OF THE TIMES



The Seiko wristwatch terminal may be what every gadget freak and wirehead has been waiting for, but does it tell the time?

The day will come of course when the kitchen sink has an RS232 serial interface; giving one to a watch seems a little extreme, and though some people think a watch is for telling the time – you know they could be right – why settle for that? If a computer can give you a timecheck (and lots of them can) why not turn a watch into a computer?

You can just see the brighteyed marketing man at Seiko figuring this one out.

So, us lucky people with BBCs and IBMs and CBMs can now plug in our watches (to the RS232 serial port, naturally) and shove them full of interesting information such as the phone number of our favourite expense account restaurant, the current time in the Cocos Islands, the bank manager's birthday (yes, the watch will bleep the day before), when to sign on at the unemployment exchange . . .

Clearly what we have here is a boon to the busy executive or the horological equivalent of the Sinclair C5: take your pick.

The Seiko RC1000 wrist terminal data manager (that's WTDM for short – a contraction to conjure with) will happily converse with a Commodore 64, all members of the Apple II family, IBM PCs and compatibles, most Tandy computers, the Acorn BBC micro, and other more obscure machines. It has four main functions (not counting mundane tasks such as telling the time, date etc). They are: memo data (eg phone numbers); schedule alarm data; weekly alarm data; and world time data.

'A boon to the busy executive or the horological equivalent of the Sinclair C5'

So how was the dream fulfilled? CMOS technology is to blame. Within the watch there are 3 tiny CMOS integrated circuits: a 4-bit microprocessor, one 2K CMOS RAM (containing the character set) and a 9K CMOS RAM which holds the data entered from the host computer. CMOS circuits require very low power and can be kept awake by small lithium batteries – they're the kind of circuits used in portable computers. However they are also expensive and that explains the price of the watch.

Schedule alarm data will set off an alarm in the watch, displaying a short message, up to a year from the date when it was programmed in. Weekly alarm data does the same thing on a weekly basis. The messages appear on a 12 character wide by two line deep liquid crystal display – so they have to be short and to the point. Each function is assigned a label. A maximum of 12 labels are available, so you could assign one label to telephone numbers, one to any other forms of data, one to time zones, one to alarms, etc. The wristwatch stores a maximum of 80 lines (24 characters long) of information: the labels split the data into manageable sections. The information is accessed by manipulating three of the six buttons on the watch.

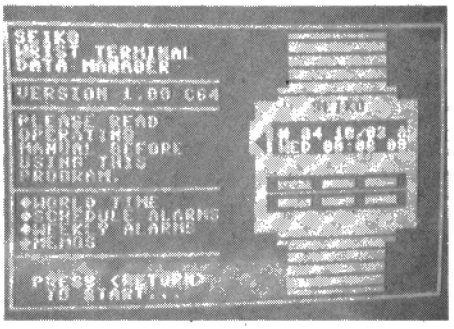
Within 80 lines you could have, say, 30 phone numbers, 10 lines of other permanent data, 15 schedule alarms, 15 weekly alarms, and the time in 10 cities.

Entering all that information requires work. First the watch has to be linked to a computer by a cable, the software booted, and the watch set to 'terminal' mode. That's easy. So is entering data, but it is time consuming (especially if you load from cassette). The software is menu driven but not quite as easy to understand as the manual pretends.

You are first asked to enter the time and date, and are then presented with five options, including edit/create watch data. Pressing edit gives a further five options: add memo label; add memo data; and add data for the world time and two alarm functions. The computer then displays 11 lines of the watch data file, which are edited using control codes in the manner of many wordprocessors (the editor does include cut and paste and string searching). The files created can be saved to disk or transmitted directly to the watch. The watch has to be put into 'receive' mode, a key is pressed on the computer, and the data sent (if all systems are go the watch bleeps – the watch likes to bleep).

Most people wouldn't mind doing that once a month but not once a week: diaries don't start sirens screaming but they're a lot easier to keep up to date.

Never mind the fancy functions, is the RC-1000 any good as a watch? Well it's heavy, bulky – a 60 gram lump – and the display lacks clarity. Nor is it cheap at £65.18. The display uses a 5 x 7 dot matrix – 35 elements – compared to the seven elements used on conventional digital watches. The display is therefore capable of producing the alphabet as well as numerals, but is not as bright and in many lighting conditions it requires at least a second glance. It's easiest to read it at night because then you need to use the light. The strap is good quality matt black anodised aluminium – attractive but it adds to the weight.



Seiko screen on the CBM64.

The display, weight, and price may put off many potential customers. But this is a keep-up-with-the-Joneses gizmo. Everyone will be wearing one in six months time. I'll hang on to my Rolex.

Data: Seiko RC1000

CPU	4-bit CMOS
Memory	2K CMOS RAM 9K CMOS RAM
Display	5 x 7 matrix two lines x 12 characters LCD
Keyboard	6 keys
Interface	RS232C 2400 BPS
Dimensions	41.8 x 36.3 x 10.6mm
Weight	60g
Price	£65.18
Supplier	Hattori (UK) Ltd, Vanwall Road, Maidenhead, Berks SL6 4UW

Spy

Keeping a watch on the latest boxes of tricks to plug into your computer, plus all that's new in software.

SOFTWARE SELECTION

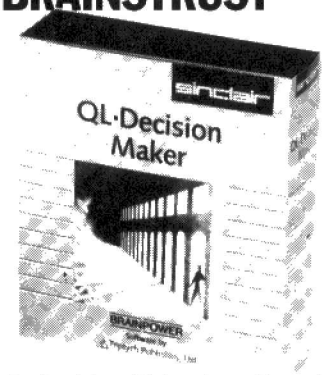
First software house to jump on the **Amstrad PCW8256** bandwagon is Hisoft. A new range of programming tools from the company is fully CPC6128 and PCW8256 compatible. **Pascal80** is a virtually standard implementation of the Pascal language; all the usual data structures and statements are supported including pointers, records and sequential files. **Devpac80** is described as the new standard in Z80 assembler development packages. The package consists of GEN80, a fast macro assembler, MON80 a front panel debugger and disassembler, and ED80 an easy-to-use full screen editor. **The Knife** is a disk track and sector editor that gives Amstrad users complete control of what goes where on their disks. Prices: Pascal80 £39.95, Devpac80 £39.95, The Knife £12.95. Hisoft has also announced the release of the C programming language for the Amstrad range of machines. Cassette version £34.95, disk £39.95. *Contact 0582 696421.*

A variety of **QL** software has come on stream in the past few weeks, much of it marketed under the Sinclair label. The Sinclair titles include **Project Planner** (£39.95) a program designed to tackle project costs and schedules and to teach the use of planning techniques. **QL Entrepreneur** (£39.95) is a complete business start-up kit designed to help those planning to go into business for themselves develop a workable business plan. **QL Decision Maker** (£39.95) is a problem solving package that aims to teach users how to project themselves into the future using a structure that includes 'all' possibilities. **QL Integrated Accounts** (£89.95) is a package of professional business software that offers a fully integrated ledger-based accounts system. With so much accounts and business software around, how come Sir Clive managed to get himself into such a financial muddle? More details on these packages and others in the Sinclair software catalogue. *Contact 0276 685311.*

Sigma Research has announced version 2.00 of **Sketchpad.** This program is driven by joystick or cursor keys and uses pop up menus to alter the various functions offered. These provide

Continued opposite

BRAINSTRUST



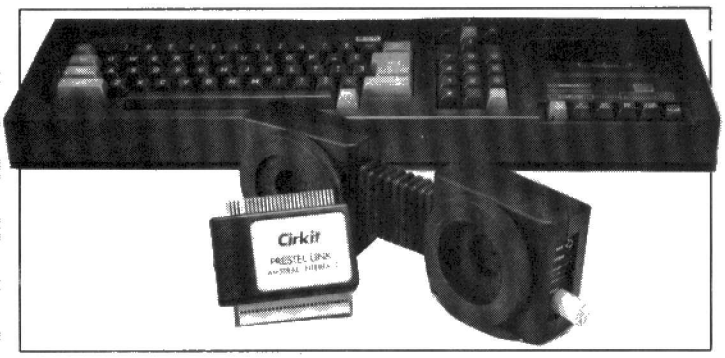
QL Decision Maker is a 'thought processor' package and one of a new range of QL software products marketed by Sinclair Research (see software column left).

CHEAP AT THE PRICE

Computer Appreciation and Matmos Ltd. are jointly offering the Matmos PC, which they describe as the lowest cost office quality CP/M system. The computer with a single disk drive costs just £250 + VAT, and a dual drive system is available at £347 + VAT.

While great play is made of the low cost of the system, unfortunately the Amstrad CPC6128 costs only £11.50 more and for that an extra 64K of memory and a green screen monitor is included. A wordprocessor ROM is available for the Matmos PC at £69 + VAT, and a 12" mono monitor costs £75 + VAT.

Contact 0227 470512.



There was no shortage of news for Amstrad users during the past month. Though the launch of the CPC6128 and the PCW8256 took centre stage, a complete Prestel link for the 464 and 6128 computers that retails at under £30 must rate as news.

The package was announced by Cirkit, a company in the component distribution business. It just so happens that Cirkit both designed and produced the acoustic coupled modems for Protech who ran into financial difficulties a few months ago. A pile of modems in the corner of the Cirkit warehouse could well have provided the motivation to design the interface card.

The software provides full Prestel support including up to 16 onscreen colours and dynamic frames. The software is supplied on cassette but is fully disk compatible (the interface unit features a through bus connector to enable a disk drive to be used at the same time as the interface).

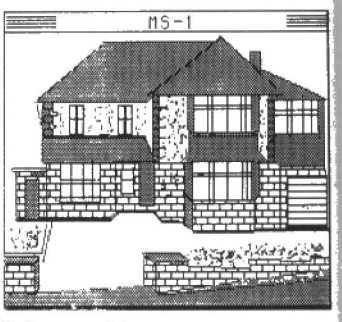
Contact 0992 444111.

READ-ONLY BOOKS

Amstrad users are well catered for in a range of new books from Melbourne House. Aimed at the games playing end of the market, new titles include the *Amstrad Games Book* which contains 30 fully documented program listings, and *Writing Adventure Games on the Amstrad.*

Another recent Melbourne House publication is the *Commodore 64 Whole Memory Guide.* It is described as much more than a mere memory map – giving a detailed description of each location, explanations of what the map is used for by the computer and how it can be put to use by the programmer. Melbourne House titles should be available from, as they say, all good book shops.

Contact 01 940 6064.



Dalex graphics

A MOUSE FOR COMMODORE

Commodore owners who feel they are missing out on the current mouse craze can relax. The Datex MS-1 is a fully optical mouse compatible with the CBM64, SX64 and the C128.

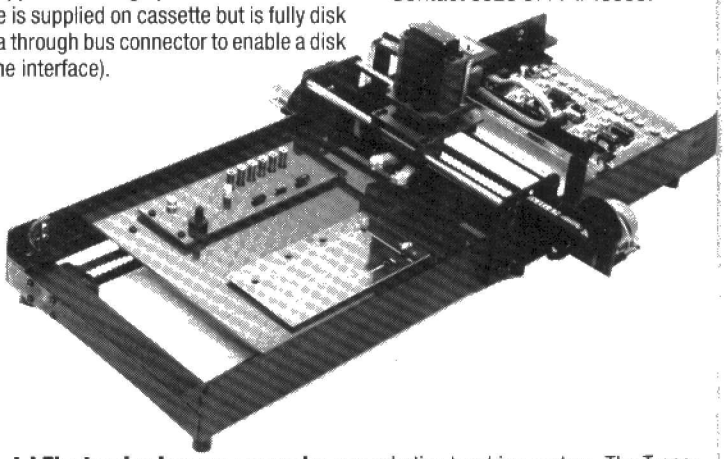
The mouse, in conjunction with a graphics software package, allows the user to create a range of impressive images. The software even builds in a pull down menu facility, keeping Commodore users up to date with the current craze for WIMPs (Windows Icons Mice Pull down menus).

Contact 01 441 1722/1590.

ROWS OF ROMS

Watford Electronics has announced a new RAM/ROM board for the BBC computer. The new design allows up to eight ROMs to be fitted to the machine and in addition provides temporary storage for another eight 16K banks of software in sockets designed to accommodate dynamic RAM ICs.

Contact 0923 37774/40588.



LJ Electronics has announced a new robotics teaching system. The Tracer offers a low cost introduction to the concepts of robotics.

The device is capable of being driven by any computer with a suitable TTL level I/O port. It features stepper motor drives on both the X and Y axes with a DC servo motor providing the drive for the Z axis and gripper open/close. Tracer is supplied with a pen carrier and three different coloured pens. This makes the unit ideal for basic plotting tasks.

An interesting feature of the Tracer is the inclusion of a PCB assembly task kit. Using this it is possible to experiment with control routines to perform PCB assembly tasks and thus effectively stimulate the industrial use of XYZ robotic systems.

Contact 0603 784001.

68000 GEM

Digital Research's GEM 'graphic user environment' is now available for MS DOS, PC DOS and 68000 based machines – including the Atari ST.

All of Digital Research's own GEM applications – GEM Desktop, GEM Collection, GEM Draw, GEM Graph and GEM Wordchart – will run on computers using the 68000 GEM DOS operating system. GEM allows users to control the computer's operating system through a visual interface: a screen that is a graphical representation of a desktop, equipped with disks, a wastebasket, folders and other functions represented by icons. Up to six additional accessories such as a clock, calculator and print spooler, will operate concurrently. The same approach is consistent throughout all the GEM applications.

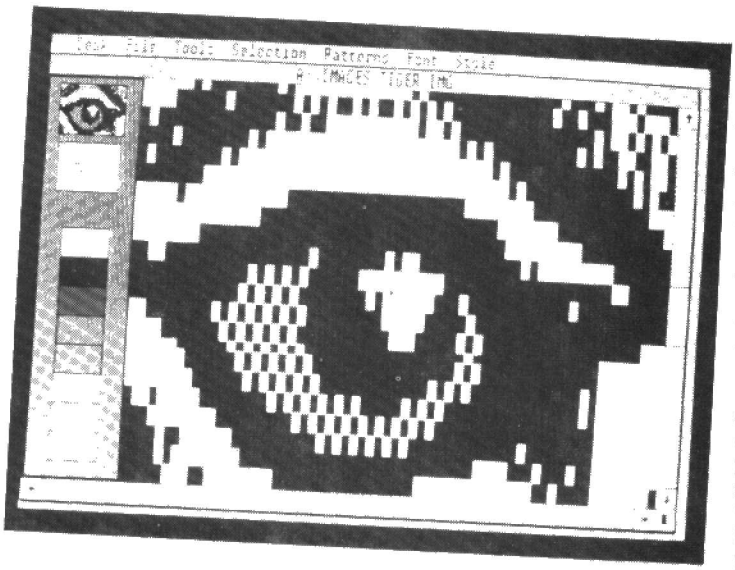
GEM Programmers Toolkit is provided to software houses developing their own new applications to run under GEM or adapting existing packages to GEM format. Instead of using calculations and coding to create, preview and use the icons, menus and operator dialogues for GEM, the Toolkit offers an interactive and graphical approach to programming. The Toolkit contains five primary components: an icon editor; a resource construction set; GEM language bindings; GEM SID, a symbolic debugger; and GEM Software with GEM Desktop precon figured for a standard IBM PC hardware configuration.

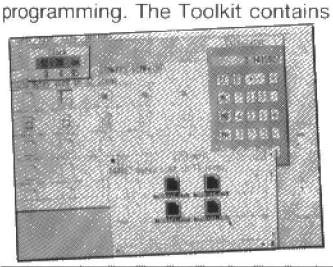
GEM Software is a graphics interface which is an extension of the main operating system, supporting full colour across all GEM applications. It holds the key to GEM's portability between computers; in contrast to previous graphics software, which needed modifying for different devices, GEM Software provides the same interface for all devices – screens, printers, plotters, etc. GEM applications can therefore draw circles, polygons and manipulate blocks of pixels while remaining independent of the device resolution and screen memory base address. GEM Software also provides the 'application environment services', with routines for the creation and manipulation of icons drop-down menus and windows. GEM Software will run on any computer with IBM PC DOS, MS DOS and Digital Research's Concurrent DOS and DOS Plus operating systems.

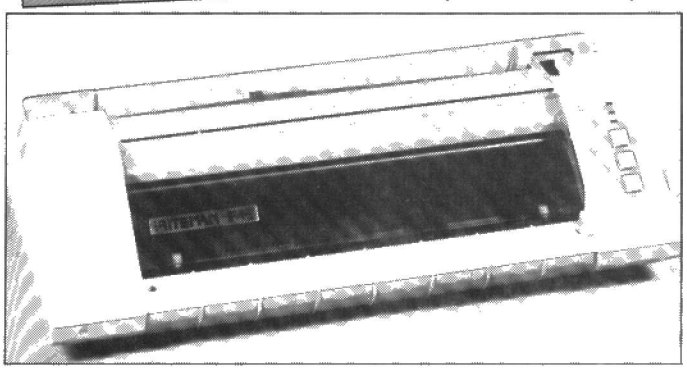
GEM Write is a word processing package similar to MacWrite that allows illustrations to be integrated into text, in addition to offering all the usual word processing facilities. GEM Write provides standard document creation and text editing options for producing reports, letters, brochures, product information, data sheets, proposals and memos. Illustrations produced using GEM Paint or GEM Draw applications can be slotted into the text at any point.

GEM Paint is a freehand painting package, supporting up to 16 colours. The tools provided by GEM Paint include paintbrushes, a spray can, a pencil, a straight-edge and a large choice of shapes and patterns. The user can create simple line drawings or cartoons, stylised illustrations or an 'oil' painting. Microscope (zoom) and 'cut and paste' functions are also provided.

GEM Draw is a structured drawing package, for producing and manipulating regular shapes on a basic grid. The user can create images with any combination of text, lines, curves, polygons, circles and boxes. For business documentation, GEM Draw can create flow diagrams, organisational charts, system diagrams, tables and logos, for example. Text can be added to any GEM Draw image direct from the keyboard. GEM Draw was designed as a tool for designers and engineers, for product design, room layouts, technical drawings, complex system diagrams and blueprints.







FRONT LOADING PRINTER

The Riteman F+ NLQ printer offers bi-directional printing at speeds up to 105 characters per second, with proportional spacing. In addition to a full 96-character ASCII italic character set, there are nine pre-programmed international character sets and 128 character modes, plus compressed, emphasised and super/subscript characters.

The machine is fully compatible with Epson FX software, and is therefore usable with virtually any personal computer. It also offers the advantage of an unusual front-loading design which permits plain paper sheets up to 10" wide in any thickness to be used, including card stock, because unlike other printers, this machine does not bend the paper.

With the standard 2K memory, up to 32 characters can be programmed by the user, but with an 8K memory option up to 256 characters can be programmed, and any or all of the 8K memory can be used for buffering.

Contact C.Itoh Electronics 01 946 4906.

Software continued

a general purpose graphics design package that can be used in a variety of applications, including design of circuit diagrams, engineering drawings, games screens and general design. *Contact Sigma Research, 231 Coldhams Lane, Cambridge CB1 3HY.*

Expresso Coppee allows back up copies of micro drive cartridges to be made in about a minute. For a limited period the package will be available for £9.95 (normal price £14.95). *Contact Total Computability, PO Box 10, Brighton, BN2 2TZ.*

Few people are buying the over priced **BBC micro,** but the number of machines in the field means that there is still profit to be made in the production of BBC software. New launches include **Micro Viewdata,** a complete offline simulation of Prestel for the BBC micro. The system was designed to support the Prestel Education Scheme. It allows users to create viewdata frames, to route them into a structured database and then to display them as if they were derived from a Viewdata service. *Contact Techmedia 0509 230248.*

Norwich Computer Services specialists in software for the BBC micro and authors of the Wordwise Plus programming ideas book has announced a **Continuous Processing ROM** for use with Wordwise. The software, supplied in ROM, overcomes the limitations of the 80 column preview mode. Documents over 1000 words long can't be previewed unless an expensive shadow RAM board has been fitted to the computer. The Continuous Processing ROM overcomes this restriction allowing the user to handle large documents (up to the total capacity of the disk system) and still preview in the 80 column mode. The ROM costs £15. *Contact TER Roberts, Lamorna, The Street, Bunwell, Norfolk NR16 1NA.*

Communique is an easy to use comms package for the **Apricot** range. For £395, users are supplied with an auto-dial modem and Telecom Gold/Dialcom software giving access to over 80,000 subscribers on an international network. *Contact 021 454 9091.*

• The **CBM64** and **C128** can, with the aid of Aztec Software's **BBC emulator,** be programmed in the same way as a BBC micro. The package, marketed under the Shade label by Micro Dealer allows the Commodore computers to accept the vast majority of commands available on the BBC computer. The few exceptions are caused by fundamental differences in the hardware of the two machines and include the disk based random access commands. The emulator provides the user with an 80 column mode, selectable by the Mode 0 command. All error messages produced by the emulator are the same as those produced by the BBC computer, for easier debugging of programs. The BBC Emulator costs £14.95 and is available from computer retailers. *Contact 07073 28181.*

PRINTOUT

Each month *Computing Age* will publish utility, graphics, communications and business software for a range of home computers, including the BBC Micro, Sinclair QL, Amstrad, CBM64, Atari 520ST, CP/M and MS DOS machines.

In this issue there are two useful wordcount routines, one for the Amstrad CPC464 (in CP/M), the other for MS DOS. The QL gets a graphics listing which demonstrates how to access QL graphics from machine code, and for BBC owners thinking of upgrading to a CP/M system there are two routines for transferring wordprocessor files from View.

We want **you** to write for this column. If you have written software for any of the above machines then send it to *Computing Age*. We pay £75 per published page, as long as the listing meets the following requirements:

Listings should be set over a maximum width of 40 columns. Each listing should include an explanation of how the software operates, of between 200 and 400 words length. Your submission should be accompanied by a disk or cassette, and a clear printout of the listing. Please include a stamped self-addressed envelope so that the software can be returned if it is unsuitable for publication. *Computing Age* cannot accept responsibility for loss or damage to software submitted.

Send your software to: PRINTOUT, *Computing Age*, Priory Court, 30-32 Farringdon Lane, London EC1R 3AU.

Wordcount 1

This simple program counts words or characters on an Amstrad CPC464 or any CP/M machine.

AMSTRAD

This very simple CP/M program counts the words in a named file (passed in the command line) and prints the value out on the console. Although it will run on any CP/M machine, it has been developed and tested on an Amstrad CPC464. Its limitations are that it cannot count more than 65535 words or characters, as the variables used to hold the counts are two bytes long. If the number of words or characters in a file does exceed 65535, the value printed out will be the 'wrapped around' value.

The program works by asking CP/M to open the specified command line file – remember that the CCP (Console Command Processor) formats the FCB (File Control Block) at 05ch prior to invoking the count, so we can safely use the default FCB and DMA. Each character is then read in and tested. Words are considered to be any contiguous group of one or more alphanumeric characters ('0' . . . '9', 'A' . . . 'Z' and 'a' . . . 'z'), everything else being a non-word. If this is not the definition you require, it only needs a change to the tests in the ISALNUM routine to implement your personal definition.

Once the number of words and characters in the file has been determined, they are printed out in decimal on the console using a standard divide by 10 routine. Notice that the file is not closed when the program has finished, as there is no need because we only ever read from it.

ADAM DENNING

Amstrad-CP/M Wordcount

```
; ****************************
; *                          *
; *         COUNT.COM        *
; *                          *
; ****************************

; A program to count the words in a
; named file. Adapted from the 8086
; version 16th July 1985

; Copyright (C) 1985 Adam Denning

; keys and general equates

lf      equ     10
cr      equ     13
ctrlz   equ     26

; CP/M equates

conout  equ     2
prints  equ     9
openf   equ     15
reads   equ     20

toptpa  equ     #06
fcb     equ     #5c
currec  equ     #7c
buffer  equ     #80

bdos    equ     5

        ld      sp,(toptpa)
        ld      de,signon
        call    printit
        ld      de,fcb
        ld      c,openf
        call    bdos
        inc     a
        jr      nz,fileok
        ld      de,errmes1
killit  call    printit
        rst     0

printit ld      c,prints
        jp      bdos

fileok  ld      a,128
        ld      (bufpos),a
        xor     a
        ld      (currec),a


; ****************************
; *                          *
; *     DE is word count     *
; *     HL is char count     *
; *     C is inword flag     *
; *                          *
; ****************************

        ld      de,0
        ld      hl,0
        ld      c,a
count   call    getbyte
        jr      nz,endprog
        cp      ctrlz
        jr      z,endprog
        inc     hl
        bit     0,c
        jr      z,notword
        call    isalnum
        jr      z,count
        inc     de
        ld      c,0
        jr      count
notword call    isalnum
        jr      nz,count
        ld      c,1
        jr      count

endprog bit     0,c
        jr      z,finally
        inc     de
finally push    hl
        push    de
        ld      de,mess1
        call    printit
        pop     hl
        call    decout
        ld      de,mess2
        call    printit
        pop     hl
        call    decout
        ld      de,mess3
        jr      killit

decout  ld      a,h
        ld      c,l
        ld      hl,fcb+4
        ld      e,5
decloop push    de
        push    hl
        ld      de,10
        ld      hl,0
        ld      b,16
divloop rl      c
        rla
        adc     hl,hl
        sbc     hl,de
        jr      nc,divcry
        add     hl,de
divcry  ccf
        djnz    divloop
        rl      c
        rla
        ld      d,l
        pop     hl
        ld      (hl),d
        dec     hl
        pop     de
        dec     e
        jr      nz,decloop
        ld      b,5
getdec  inc     hl
        ld      a,(hl)
        or      a
        jr      nz,gotdec
        djnz    getdec
        inc     b
gotdec  push    hl
        push    bc
        ld      a,(hl)
        add     a,"0"
        ld      e,a
```

```
        ld      c,conout
        call    bdos
        pop     bc
        pop     hl
        inc     hl
        djnz    gotdec
        ret

isalnum cp      "0"
        jr      c,notalpha
        cp      ":"
        jr      c,alpha
        cp      "A"
        jr      c,notalpha
        cp      "Z"+1
        jr      c,alpha
        cp      "a"
        jr      c,notalpha
        cp      "z"+1
        jr      c,alpha
notalpha
        or      1
        ret
alpha   xor     a
        ret

getbyte push    hl
        push    de
        push    bc
        ld      a,(bufpos)
        cp      128
        jr      nz,inbuff
        call    getbuff
        jr      z,inbuff
getoutb pop     bc
        pop     de
        pop     hl
        ret
inbuff  ld      c,a
        ld      b,0
        ld      hl,buffer
        add     hl,bc
        ld      c,(hl)
        inc     a
        ld      (bufpos),a
        xor     a
        ld      a,c
        jr      getoutb

getbuff ld      c,reads
        ld      de,fcb
        call    bdos
        or      a
        ret

; Messages

signon  defm    "COUNT V1.1 (C) 1985"
        defm    " Adam Denning"
        defb    cr,lf,"$"
errmes1 defm    "Cannot find that file$"
mess1   defm    "Counted $"
mess2   defm    " words and $"
mess3   defm    " characters$"

; Variables

bufpos  defs    1
```

Wordcount 2

Another simple wordcount program, this time for PC DOS/MS DOS machines.

MS DOS

This is the same as the wordcount program above, but for PC DOS 2.0/MS DOS 2.11 (and above). It counts the number of words and characters in a named file (passed in the command line) and prints the value out on the console. It will run on any MS DOS machine, and was developed and tested on a Zenith Z-150 PC compatible. Again, it cannot count more than 65535 words or characters, as the registers used to hold the counts are two bytes long. If the number of words or characters in a file exceeds 65535, the value printed out will be the 'wrapped around' value.

The program takes great care to use the Unix-style open, close and read calls, so that it can accept filenames which include directory paths, or which are devices, and so that the output from the program may be redirected or piped to other programs.

To implement these calls successfully, the pathname taken from the command line must be terminated with a byte of zero to convert it to a C string. This is done by the GETASCSTR routine.

The source file is given in the format required by Digital Research's RASM86 assembler, but there isn't much effort involved in converting it to that required by Microsoft's MASM. Note that the end result is a COM file, not an EXE file, so it must be prepared with this process:

RASM86 COUNT [or MASM COUNT;]
LINK COUNT;
EXE2BIN COUNT.EXE COUNT.COM

Words are again considered to be any contiguous group of one or more alphanumeric characters ('0' . . . '9', 'A' . . . 'Z' and 'a' . . . 'z'), everything else being a non-word. If this is not the definition you require, a change to the tests in the ISALNUM routine implements your definition.

Once the number of words and characters in the file has been determined, they are printed out in decimal on the console using a standard divide by 10 routine. Note that the file is closed when the program has finished, as the MS DOS Unix calls follow the C practice of allocating file handles to each open file-device, and these must be released when finished with or the system will complain with a 'Too many files open' style error.

ADAM DENNING

PC DOS/MS DOS Wordcount

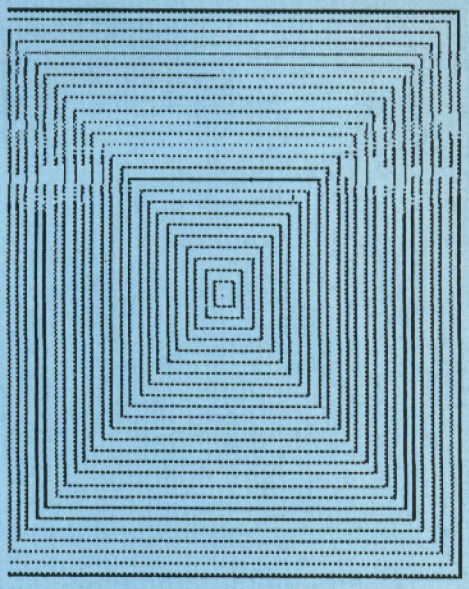
```
; ********************************
; *                              *
; *           COUNT.COM          *
; *                              *
; ********************************


; Another version of the COUNT program,
; this time using XENIX-compatible
; MS-DOS calls to allow directories in
; the name of the file to be counted

; By Adam Denning 24th June 1985
; Copyright (C) 1985 Adam Denning

; keys and general equates

opread  equ     0       ; open for read
lf      equ     10
cr      equ     13
ctrlz   equ     26
handle  equ     5ch

; MS-DOS function call equates

conout  equ     02h
prints  equ     09h
open    equ     3dh
close   equ     3eh
read    equ     3fh
endprog equ     4ch

        cseg
        org     80h
comline:
        org     100h
start:
        mov     dx,offset signon
        mov     ah,prints
        int     21h
        mov     dx,offset comline
        call    getascstr
        jnz     openit
        mov     dx,offset errmes1
killit:
        mov     ah,prints
        int     21h
        mov     ah,endprog
        int     21h

openit:
        mov     al,opread
        mov     ah,open
        int     21h
        jnc     gotfile
        mov     dx,offset errmes2
        jmps    killit
gotfile:
        mov     ds:.handle,ax
        xor     dx,dx
        xor     bx,bx
        mov     cl,0
count:
        call    getbyte
        jnz     .progend
        cmp     al,ctrlz
        jz      progend
        inc     bx
        test    cl,1
        jz      notword
        call    isalnum
        jz      count
        inc     dx
        xor     cl,cl
        jmps    count
notword:
        call    isalnum
        jnz     count
        mov     cl,1
        jmps    count

progend:
        test    cl,1
        jz      finally
        inc     dx

finally:
        push    bx
        push    dx
        mov     dx,offset mess1
        mov     ah,prints
        int     21h
        pop     ax
        call    decout
        mov     dx,offset mess2
        mov     ah,prints
        int     21h
        pop     ax
        call    decout
        mov     bx,ds:.handle
        mov     ah,close
        int     21h
        mov     dx,offset mess3
        jmps    killit


decout:
        mov     bx,offset comline-1
        mov     di,5
decloop:
        mov     cx,10
        xor     dx,dx
        div     cx
        mov     cx,dx
        add     cl,'0'
        mov     [bx+di],cl
        dec     di
        jnz     decloop
        mov     al,0
        inc     bx

loopnum:
        or      al,al
        jnz     printit
        cmp     byte ptr [bx+di],'0'
        jz      loopit
printit:
        mov     dl,[bx+di]
        call    outchar
        or      al,1
loopit:
        inc     di
        cmp     di,5
        jnz     loopnum
        or      al,al

        jnz     outprog
        mov     dl,'0'
outchar:
        mov     ah,conout
        int     21h
```

```
outprog:
        ret

isalnum:
        cmp     al,'0'
        jl      notalpha
        cmp     al,'9'
        jle     alpha
        cmp     al,'A'
        jl      notalpha
        cmp     al,'Z'
        jle     alpha
        cmp     al,'a'
        jl      notalpha
        cmp     al,'z'
        jle     alpha
notalpha:
        or      al,1
        ret
alpha:
        xor     al,al
        ret

getascstr:
        mov     di,dx
        mov     al,[di]
        or      al,al
        jz      endgetasc
lookasc:
        inc     di
        call    issep
        jnz     startasc
        dec     al
        jnz     lookasc
endgetasc:
        ret
startasc:
        mov     dx,di
contasc:
        inc     di
        call    issep
        jz      putasc0
        dec     al
        jnz     contasc
putasc0:
        mov     byte ptr [di],0
        or      al,1
        jmps    endgetasc

issep:
        cmp     byte ptr [di],' '
        jz      yessep
        cmp     byte ptr [di],','
        jz      yessep
        cmp     byte ptr [di],';'
        jz      yessep
        cmp     byte ptr [di],'='
        jz      yessep
        cmp     byte ptr [di],09h
yessep:
        ret

getbyte:
        push    bx
        push    dx
        mov     dx,offset comline
        mov     bx,ds:.handle
        push    cx
        mov     cx,1
        mov     ah,read
        int     21h
        jnc     ygetc
nngetc:
        or      al,1
        jmps    ngetc
ygetc:
        or      al,al
        jz      nngetc
        mov     si,dx
        mov     al,[si]
        xor     ah,ah
ngetc:
        pop     cx
        pop     dx
        pop     bx
        ret

signon  db      'COUNT V2.0 (C) 1985 '
        db      'Adam Denning',cr,lf,'$'
errmes1 db      'Please specify a file$'
errmes2 db      'Cannot find that file$'
mess1   db      'Counted $'
mess2   db      ' words and $'
mess3   db      ' characters$'

        end     start
```

Spiral square

Immortal art on the QL screen – this graphics program never kills itself.

QL



This little program demonstrates some of the graphics capabilities of the QL and how to access them from machine code. This is surprisingly easy, despite the fact that each graphics routine requires its parameters in floating point format.

For best effect, assemble the program and then execute it four or eight times in parallel, like so:

```
MODE 0
FOR a=0 TO 7: EXEC FLP1_THISPROG
```

If the program is run in mode eight rather than mode zero, it can look a bit prettier as this mode allows more colours on the screen.

The program works by opening a screen device to cover the entire QL screen with the UT.SCR utility routine. This returns with the channel ID of the device as A0. The program then enters a loop in which 50 groups of four lines are drawn in succession, giving a spiralling square effect. Each time around the loop, the ink colour is changed to a 'random' value between 1 and 255. It must be said that the random number generation routine used here is not that good, but it suffices.

Each line is drawn by stacking a two-byte integer on an A6 relative stack pointed to by A1, and then floating the number with the help of the RI.EXEC package. Various numbers are stacked, derived from the D6 loop counter. The values are combinations of D6 and 100-D6, which with the duplication of values on the stack provided by the DUPLIC routine, gives us four lines at a time which describe a square of ever-decreasing proportions.

The lines themselves are drawn with the SD.LINE trap routine, which requires its four parameters (start_x, start_y, end_x, end_y) to be floating point numbers on an arithmetic stack pointed to by A1. Unlike the RI.EXEC routine, though, this screen driver routine expects the stack to be absolute rather than A6 relative. As our value of A1 is relative to A6, we have two options. We may either add the contents of A6 to A1, using a

```
ADDA.L      A6,A1
```

instruction, or we can be more elegant and use the special TRAP #4 routine provided for us by QDOS. This does not actually alter the values of any registers, but simply sets a byte in the channel definition block of our screen device to tell it that the addresses passed to it are going to be A6 relative rather than absolute.

Notice that the program never kills itself, so it will never end. If you have the KJOB routine or the QL Toolkit from QJUMP, you can kill the job from within the SuperBasic interpreter. If not, you'll need to reset the machine when you get bored!

ADAM DENNING

QL Graphics Program

```
* A simple graphics program for
* Computing Age. By Adam Denning
* 2nd August 1985

          SIZE      300


SD_SETIN  EQU       $29
SD_LINE   EQU       $31
UT_SCR    EQU       $C8
RI_EXEC   EQU       $11C

FLOAT     EQU       $08
DUP       EQU       $16


RAND_NUM  EQU       $2802E

          ADDQ.L    #4,A7
          BRA.S     START
          DC.W      0
          DC.W      $4AFB
          DC.W      8
          DC.B      'PICTURES'

RANDOM    MOVE.W    RAND_NUM,D1
          ROXL.W    #6,D1
          MOVE.W    D1,RAND_NUM
          OR.W      (A1),D1
          ROXR.W    #3,D1
          ANDI.W    #$FF,D1
          ORI.W     #1,D1
          RTS
```

```
START     LEA.L     PBLOCK,A1
          MOVE.W    UT_SCR,A2
          JSR       (A2)
          MOVE.W    6(A3,D1.L),RAND_NUM
          LEA.L     -50(A5),A5

MAINLOOP  MOVEQ     #-1,D3
          BSR.S     RANDOM
          MOVEQ     #SD_SETIN,D0
          TRAP      #3
          MOVEQ     #100,D6
NEXTLOOP  MOVEA.L   A5,A1
* First line
          MOVEQ     #100,D1
          SUB.W     D6,D1
          MOVE.W    D1,0(A6,A1.L)
          BSR       FLOATIT
          BSR       DUPLIC
          BSR.S     DUPLIC
          SUBQ.L    #2,A1
          MOVE.W    D6,0(A6,A1.L)
          BSR.S     FLOATIT
          MOVEQ     #-1,D3
          MOVEQ     #SD_LINE,D0
          TRAP      #4
          TRAP      #3
          MOVEA.L   A5,A1
* Second line
          MOVEQ     #100,D1
          SUB.W     D6,D1
          MOVE.W    D1,0(A6,A1.L)
          BSR.S     FLOATIT
          SUBQ.L    #2,A1
          MOVE.W    D6,0(A6,A1.L)
          BSR.S     FLOATIT
          BSR.S     DUPLIC
          BSR.S     DUPLIC
          MOVEQ     #-1,D3
          MOVEQ     #SD_LINE,D0
          TRAP      #4
          TRAP      #3
          MOVEA.L   A5,A1
* Third line
          MOVE.W    D6,0(A6,A1.L)
          BSR.S     FLOATIT
          BSR.S     DUPLIC
          BSR.S     DUPLIC
          MOVEQ     #100,D1
          SUB.W     D6,D1
          SUBQ.L    #2,A1
          MOVE.W    D1,0(A6,A1.L)
          BSR.S     FLOATIT
          MOVEQ     #-1,D3
          MOVEQ     #SD_LINE,D0
          TRAP      #4
          TRAP      #3
          MOVEA.L   A5,A1
* Fourth line
          MOVE.W    D6,0(A6,A1.L)
          BSR.S     FLOATIT
          MOVEQ     #100,D1
          SUB.W     D6,D1
          SUBQ.L    #2,A1
          MOVE.W    D1,0(A6,A1.L)
          BSR.S     FLOATIT
          BSR.S     DUPLIC
          BSR.S     DUPLIC
          MOVEQ     #-1,D3
          MOVEQ     #SD_LINE,D0
          TRAP      #4
          TRAP      #3

          SUBQ.W    #2,D6
          BNE       NEXTLOOP
          BRA       MAINLOOP

FLOATIT   MOVEQ     #FLOAT,D0
          BRA.S     DO_OP
DUPLIC    MOVEQ     #DUP,D0
DO_OP     MOVE.W    RI_EXEC,A2

          JMP       (A2)

PBLOCK    DC.W      $0701
          DC.W      7
          DC.W      512
          DC.W      256
          DC.W      0
          DC.W      0

          END
```

View file transfer

Changing processors? This is a step by step procedure to turn View files into CP/M data files.

BBC

Upgrading a computer causes one often insuperable problem: how do you transfer old files to a new wordprocessor? The code below can be used to transfer BBC files (for example View or Wordwise) to a CP/M system such as Perfect Writer, which is used on the Torch Z80 second processor.

This code was written to transfer View files to Perfect Writer, but should work for other CP/M wordprocessors. Two methods are given: **Listing 1** is reliable but can be tediously slow; **Listing 2** is much faster but doesn't always work – it can lead to a troublesome cul-de-sac, 'Can't extend file'. Whichever you choose first should be an accurate test of your personality!

It is assumed you have a BBC B, Torch Z80 second processor, Perfect Writer, and the RDACORN utility on the Torch system disk. When the process is complete you may find that all the View files are on one side of the PW disk. You can soon have the old files placed into individual PW files using the multiple file and split screen facility.

Finally, what happens if you want to perform the same exercise in reverse? What happens to Perfect Writer's auto footers, typeface commands etc? Well try it and see – I'm not going to do all the work for you.

ROBERT JAMIESON

LISTING 1

```
Source in A:              (ie View files)
RDACORN in B:             (ie Torch System disc)
B <BREAK>                 (now in BASIC)
<RETURN>
*WORD                     (now in View)
*D.
NEW
*.
READ OLDNAME              (putting old file into
                          View)
Mode 3                    (Use Mode 7,if file
                          will not fit, or res-
                          ort to continuous
                          processing)

                          (Then strip all View
                          control codes by rem-
                          oving entire lines
                          and replaceing any
                          text you wish to
                          retain)
SAVE N.OLDNAME
*SPOOL T.OLDNAME
SCREEN N.OLDNAME          (Place a heavy weight
                          on the shift key!)
*SPOOL
<CONTROL> <BREAK>         (returns to CPN)

B:
RDACORN
A
T                         (Topside source disk)
T.OLDNAME                 (The Acorn filename)
B:OLDNAME.MSS             (CPN filename)
T                         (answers question bi-
                          nary or text file. Now
                          be patient while it
                          all happens)

                          (Remove source disk
                          from A and insert PW)
A:
PW B:OLDNAME.MSS

                          (You now have a PW
                          file. Remove CTRL Js
                          using global replace)
```

LISTING 2

```
Source in A:
RDACORN in B:
B <BREAK>
<RETURN>
*WORD
*D.

*FX5,1                    (enables printer)
<CTRL> B                  (ouput to printer)
*.                        (gives hard copy)
<CTRL> C                  (ceases ouput to
                          printer)
*SPOOL T.OLDNAME
SCREEN OLDNAME1 OLDNAME2...
                          (spooling all View
                          files into one file
                          for transfer. If the
                          total length is too
                          great - 'can't extend'
                          - copy source onto
                          blank Acorn disk,
                          start again, but this
                          time spool across
                          the drives)
*SPOOL
<CTRL> <BREAK>

B:
RDACORN
A
T
T.OLDNAME
B:OLDNAME.MSS
T
                          (remove source disc
                          from drive A, insert
                          PW in A)
A:
PW B:OLDNAME.MSS
```

EXIT

The future is Tripos

Simon Craven, the new heretic, dismisses the icon-wielding high priests of software as has-beens.

Metacomco could be for the 1990s what Microsoft is for the 1980s and Digital Research was for the 1970s. There, I've said it now, and you old-timers can stop saying *who?* and wipe the smiles off your faces.

You might have heard of Metacomco, a software house based in Bristol. You probably know them by their range of languages and utilities for the Sinclair QL. It is less well known that Metacomco wrote Personal Basic for Digital Research to sell for MS DOS machines, but once you know that fact it seems less surprising that Commodore should have chosen Metacomco to provide the operating system and a lot of supporting software for its vitally important Amiga project. But even if you know all this, it seems just a little presumptuous to make wild statements about Metacomco dominating the future as Digital Research did the past. But bear with me for a minute.

When you consider what fun you can have with a Motorola 68000 processor, it's surprising that no-one seems to have developed a general-purpose operating system for 68000-based personal computers. The 8080 and Z80 have 8-bit CP/M and its derivatives, and the 8088, 8086 and their more advanced descendants all run versions of MS DOS or IBM PC DOS. For the 68000, however, there is nothing you can describe as the industry standard operating system.

Oddly, the strength of the 68000's appeal to avant-garde programmers might have contributed to this deficit. 68000 programmers are not like ordinary people; for many of

'Metacomco could be for the '90s what Microsoft is for the '80s'

them, the merit of a program lies in its stylistic elegance and compactness of code, not in what it actually does. If they need something as mundane as an operating system, they will quickly hack out something makeshift before getting back to what *really* interests them.

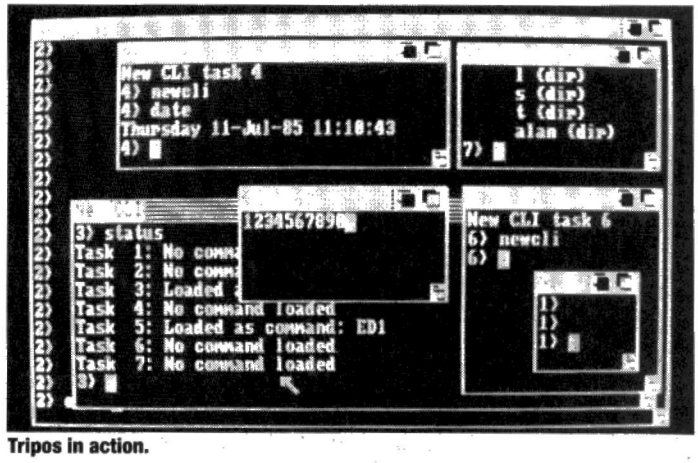
Consequently, the most widely-used systems for 68000 personal computers are developed and owned by the manufacturers of the machine in question – QDOS in the case of Sinclair Research, and Apple's Lisa/Macintosh OS. Of the other 68000 operating systems Unix is inapplicable to single-user systems, notably because you would need a 5Mb hard disk in every machine just for Unix itself. CP/M 68K is a crude and limited system, a hangover from a sudden burst of enthusiasm at Digital Research one day when it was decided to put a version of CP/M on just about every processor known to science. It is a pig to use and does not support multi-tasking, which is a serious failing in a 68000 environment.

The UCSD p-system is not really an operating system, in many minds. It's a series of menus which interpret commands, but it lacks a lot of the deep-down features which an all-purpose 68000 operating system should have.

GEM, as supplied with the Atari ST, is a very pretty graphics user interface, but it relies on the presence of CP/M 68K, or in the case of 8086 machines, MS DOS, lurking underneath to do the real work.

QDOS is nearer the mark. Its implementation on the QL is rather heavily orientated towards the use of Basic as the user's standard environment, but that is easily changed by a competent programmer. As a proprietary operating system, owned by Sinclair Research, it is highly unlikely to appear on any other machines (barring future QL developments) and cannot be the generic answer for 68000 micros. Similarly, the Macintosh OS is restricted to machines made by Apple.

So where should the aspiring designer of 68000-based hardware look? No further than a system called Tripos 68000, developed by none other than Metacomco in Bristol. Tripos has been around in various forms for a few years – long enough to be reaching a mature stage of development, but not so long that it creaks in its bones. It is a full multi-tasking operating system, independent of hardware, and thus highly portable. Although the current



Tripos in action.

thrust of development is towards single-user systems, Tripos has a first cousin running the Cambridge Ring network and its architecture makes it highly suitable for networking and multi-user machines.

Commodore asked to see Tripos with a view to using it as an emergency back-up for the Amiga in case their own in house development went disasterously off the rails. Shortly after seeing what it could do, the in-house project was stopped on the basis that it was unnecessary. The result is that the Amiga – surely destined to be a highly influential computer – is equipped with a non-proprietary operating system, and Metacomco is entitled to produce similar software for other manufacturers.

Another advantage of Tripos/AmigaDos over rival systems is its flexibility. Some operating systems reflect the True Beliefs of the people who developed them: in the case of the Macintosh, you *shall* use the mouse and the icons, even if you don't like them and they are not the best way of doing something. Similarly, plain or vanilla MS DOS and CP/M force you into certain irritating working practices, not least of which is the pretence that you are working on a glass teletype.

Tripos is religion-free. In its Amiga implementation, it can be used *via* a WIMP interface (still multitasking, and the only such user interface I have seen which is fast enough not to be irritating) but if you don't like WIMPS, or if you want to do something (like software development) for which it would be inappropriate, you can revert to a conventional line-by-line user interface.

Okay, so maybe it's hopelessly idealistic to predict that anything this good could be adopted as a standard by the personal computer community in the next few years. But, impregnable though they may seem, giants such as Microsoft and Digital Research are not immune to the consequences of progress. In 1980 it would have seemed absurd that a relatively small software house with very little operating system experience would rudely boot the

'It's idealistic to predict that anything this good could be adopted as a standard'

manufacturers of the all-conquering CP/M out of their position as producers of the World's Favourite Operating System, yet MS DOS pushed CP/M 86 firmly into the shade when the 8086/8088 generation of personal computers came into vogue.

Whether Metacomco can pull off the same trick depends on more than the technical excellence of Tripos, but all the ingredients for success are there.

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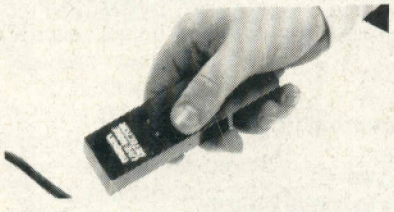

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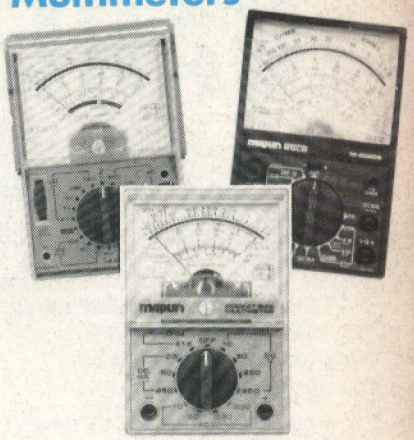

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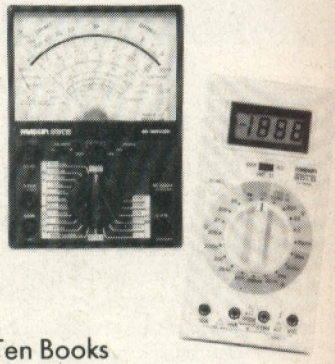

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